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JULY 1955

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Collective Review

UROLOGY—FROM 1905 TO 1955

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When we take a backward look at urology as it was in 1905, when Surgery, Gynecology and Obstetrics was launched on its distinguished course, it may appear at first glance that all progress has occurred since that time. The urologist of 1905 was still exploring the advantages of the cystoscope; he had no laboratory tests to guide him, except for rudimentary urinalysis; x-ray diagnosis was still in its infancy, and no special methods were yet available for study of the urinary tract; radiation therapy was yet to become a practical reality; anesthetics were dangerous and sometimes lethal; infections were difficult or impossible to control; and knowledge of physiology and biochemistry was as yet extremely meager. Although numerous surgical procedures on the kidneys, ureters, and bladder had been devised, their general use was limited by the extreme hazards they entailed, and it was only in the larger medical centers that such operations were performed at all. The foregoing is all true, but nevertheless it is a mistake to think of modern urology as a development merely of the past 50 years, for the half century before 1905 saw developmental progress just as striking as that of the immediate past. In fact, that period might be likened to the learning and growth of early childhood, which, organically is the most rapid of all, while the period from 1905 to 1955 rather resembles the growth of adolescence, with its organization, integration, and filling in of details, based on the broad patterns of learning acquired during earlier years.

It is significant to remember that urology had already gained sufficient stature as a specialty by 1902 that the need for interchange of ideas among workers in this field led to the founding of the American Urological Association, in New York, on Washington's birthday. The growth of this organization was extremely rapid, and its function as an integrating force, and in advancing the methods, standards, and training of the urological profession of today has been most vital and significant. While we are looking back to this earlier day, it is interesting to note that Bransford Lewis, in his presidential address before the American Urological Association in 1907, paid tribute to the accomplishments of the "fathers" of urology. Among those he cited were Sir Henry Thompson, for his contributions to the knowledge of prostatic hypertrophy and calculous disease, Newman, Knowsley, Thornton, and Morris, for advancing renal surgery, and also Harrison, Sir Benjamin Bell, Fenwick, and others. Among the French pioneers were Civiale, Albarran, Denos, Pousson and others. From Austria and Germany fundamental contributions were made by Dittel, Casper, Simon, Fenger, Israel, Kollman, and most important of all, Max Nitze, the father of cystoscopy. Earlier luminaries in the United

States included Bigelow, Keys, Bangs, Senn, Fenger, Wishard, Belfield, Meyer and many others.

These men passed their knowledge and their instruments on to worthy successors, who were our immediate predecessors, the founding fathers of the American Urological Association, and the ones who paved the way for us and taught us all they knew. Among the names that recur over and over in the following sketchy review are those of Young, Lewis, Lower, Mayo, Judd, Braasch, Hinman, Chute, Lowsley, Squier, Kirwin, Shaw, Rowntree, Cabot, Hunt, McCarthy, and numerous others. These men advanced the structure of urology on the foundation laid by the pioneers of the last century, and made possible many of the advances and much of the therapeutic progress of the past 15 or 20 years. Those of us practicing today can do no better than they did in augmenting the heritage we shall pass on to our successors.

Despite the solution of many problems which constituted formidable or impossible obstacles to the urologic surgeon of 1905, we still face many serious problems and puzzles that are crying for solution. No doubt, the reviewer who will cover the field of urology in the centennial year of SURGERY, GYNECOLOGY AND OBSTETRICS will feel that we today were working almost completely in the dark in relation to the knowledge he will then enjoy. Nevertheless, it is more than likely that there will be many problems yet to solve even 50 or 100 years hence.

To turn backward again and look over the past 50 years, it is evident in retrospect that the achievements and progress in urology during this period were derived from several sources. The perfection of the cystoscope and the development of constantly improved instruments for diagnosis and treatment were major factors. These were augmented by functional tests and other diagnostic procedures, especially by developments in radiologic diagnosis. Bacteriologic and biochemical research led ultimately to chemotherapy and antibiotics for the control of infection, ion and hormonal control, and substitution therapy in conditions involving metabolic disturbances. Growth has been influenced by innumerable refinements in surgical technique and in accessory measures, such as anesthesia and preoperative and postoperative care. The appreciation of the relationship of diseases of the genitourinary tract to general medicine and the basic sciences has opened up entirely new fields of diagnosis and therapy for the urologist. Newer knowledge of embryology, cystology, genetics, radiology, and radiobiology, and more detailed biochemical studies are adding new dimensions to the domain of urology constantly and helping to solve the problems, new and old, that confront us in our daily tasks.

UROLOGIC INSTRUMENTS[1]

Since 1920, the development of new instruments or modification of existing instruments for examination and transurethral treatment of the bladder and urethra has not only kept pace with the development of instruments in other fields of medicine, but, in most instances, has gone far ahead. The many new instruments which have been developed, and the modifications of older ones, have been a large factor in establishing urology as one of the outstanding medical specialties, particularly from the standpoint of accuracy of diagnosis and safe, effective, instrumental treatment.

The development of the foroblique optical system and the McCarthy foroblique panendoscope represented the first basic change in diagnostic urologic instruments since the inception of the cystoscope. It was the forerunner of many new examining and operating instruments and established a basis for the development of several new urologic procedures. Presented by J. F. McCarthy in 1923, the foroblique optical system provided a visual field forward and oblique. The optical axis of the system was deflected 27 degrees from the axis of the telescope, permitting a clear forward field of vision unobstructed by the lamp bulb located at the distal end of the telescope. The total visual field embraced an angle of 55 degrees. This provided a natural field of vision and greatly facilitated instrumentation, orientation, and interpretation of pathologic conditions. Combined with the mechanical features of the panendoscope, the foroblique optical system provided an instrument which simplified procedures such as examination, catheterization, biopsy, and fulguration. The many advantages derived from the use of the foroblique optical system have been demonstrated by its use in a large variety of urologic instruments subsequently developed. Adaptations of the McCarthy system for special uses include the visual cold punch (1928); the ejaculatory duct instrument (1932);

[1]For material in this section I am greatly indebted to Mr. Frederick J. Wallace, New York 59, N. Y.

and the routine and miniature cystoscopes. The periscopic cystoscope provided another innovation, i. e., a foroblique lens system with an adjustable front surface mirror recessed behind the objective lens. Elevation of the mirror permitted visualization in the forward, oblique, right angle, and retrograde aspects, making possible a complete examination of the bladder, including the bladder neck, with one telescope. The deflecting panendoscope provided an adjustable mechanical deflector to facilitate manipulation and the passage of catheters and other accessories.

One of the most versatile and popular cystoscopes used by urologists throughout the world has been the Brown-Buerger cystoscope. Originally presented in 1909, it has been continually improved and modified throughout the years. Among the many modifications and improvements have been the addition of operating and double catheterizing telescopes, the convertible telescope, improved configuration of the sheaths, new locking mechanisms, improved stopcocks, and improved mechanisms for imparting motion to the lid deflector. In response to the requirements for a smaller calibered instrument, the Brown-Buerger cystoscope has been successfully reduced to sizes as small as 16 Fr. The Hugh H. Young cystoscope, presented in 1927, provided facilities for examining and operating right angle telescopes and for examining retrograde telescopes. Water inlets and outlets and the light contact were designed to rotate independently of the sheath, and thereby prevent entanglement of the light connector and water inlet tubing when the sheath rotated in the urethra during cystoscopy. The Ravich convertible cystoscope (1928), a modification of the Brown-Buerger instrument, incorporated a major change in sheath construction and the lamp was placed close to the objective to increase illumination. These changes facilitated close inspection of the bladder and urethra. The Kirwin cystoscope introduced several new features of instrumental construction, and the achromats of the optical system and the objective and ocular portions of the instrument were sealed with special heat-resisting optical cement, which permitted sterilization by boiling. Several female cystoscopes utilizing various optical systems have been devised. The Brown-Buerger female convertible cystoscope, presented in 1934, provided an instrument with a short working length and large caliber, which permitted use of large examining telescopes.

Nonoptical urethroscopes, widely used in the early 1920's, have been largely supplanted by other instruments, or their use has been curtailed by other methods of treatment. The principal contributors to nonoptical urethroscopes were Ballenger, Wilhelm, Buerger, Squier, Young, McCarthy, Ravich, and Lowsley. A cystourethroscope utilizing a right angle optical system, devised by Buerger, permitted examination of the urethra and the bladder with a single sheath instrument. McCarthy presented a new convertible close vision cystourethroscope. To provide a good field of vision at close range, the optical system was designed so that the image was formed within the objective instead of at the surface. This novel concept permitted accurate visualization of the urethra with tissue close to or in contact with the objective surface. The Lowsley-Peterson endoscope was designed for the examination and treatment of the urethral aspects of the vesical neck and of the anterior and posterior urethra, as well as for other endoscopic procedures.

Urologic diagnosis and treatment of infants and children have been facilitated by development, over the years, of many special small cystoscopic instruments that make it possible to carry out complete examination of children and infants without injury. The miniature sheaths, miniature telescopes devised for this work, represent the highest standard of instrument making. Among the principal contributors of instruments for pediatric urology have been Beer who devised a small examining and single catheterizing cystoscope, Campbell who developed several infant cystoscopes for examination and operation, McCarthy who devised single and double catheterizing, examining and operating infant cystoscopes, and Young, Butterfield, Laidley, and McCrea.

Substantial advances have been made in visual lithotrites which would permit crushing of small and moderately large calculi within the bladder. The Ravich lithotriptoscope was an oval instrument provided with a right angle optical system and a means for irrigating the bladder without removal of the foroblique telescope; this instrument was capable of crushing very hard stones. The Kirwin lithotrite utilized the Young right angle telescope for its visual system. The jaws of this instrument were serrated to facilitate grasping of the calculi, and their motion was lateral. The Hendrickson lithotrite was another instrument utilizing the McCarthy foroblique optical

system. Its advantages were that it could be readily disassembled for cleaning and the jaws were exceptionally strong, having a compressive strength of 800 pounds. Other contributors to the field of visual lithotrites were Alcock and Young. The Lowsley grasping forceps was designed principally for biopsy in the bladder and for removal of foreign bodies. It was occasionally used for the crushing of small and soft stones. Other instruments devised for biopsy or foreign body removal were the Young rongeur and the Deming biopsy forceps.

The development of vacuum tubes and electronic equipment capable of producing high frequency currents introduced a new medium by which tissue could be separated and removed. Urologists were quick to recognize the prospective advantages of electrosurgery and many devised instruments and accessories which employed high frequency electrosurgical currents for the removal of obstructive tissue at the vesical orifice, by the transurethral route, and for biopsy, fulguration, and other procedures. Among the early contributors to this procedure were Young, Caulk, McCarthy, Stern, Rose, Kirwin, Beer, Davis, Day, Bugbee, Geraghty, Mathé, and others. To this list should be added the names of Reinhold Wappler for his contributions to the design and construction of instruments, and Frederick Wappler for his work on the development of electrosurgical machines producing high frequency current activating the cutting loops. Stern presented an instrument called a resectoscope which employed a high frequency current for cutting in a water medium. After introduction of the McCarthy foroblique lens system, an electrotome was devised utilizing this lens system with its improved field of vision. This instrument, presented by McCarthy, employed a large cutting loop which permitted removal of comparatively large portions of prostatic tissue. It employed a rack and pinion mechanism for imparting motion to the loop, similar to that used in the Stern resectoscope; later the instrument became generally known as the Stern-McCarthy visual electrotome. Various modifications of the original instrument provided a means whereby obstructing tissue at the vesical orifice could be removed with a rapidity and safety never before possible.

Advent of this instrument soon aroused great interest and many modifications of the electrotome were introduced by urologists in their efforts to improve the technique and simplify the procedure of transurethral prostatic resection. Nesbit devised an electrotome in which motion was imparted to the loop by direct pressure of the thumb on a ring attached to the insulating block, enabling the surgeon to operate with the instrument in one hand while using the other hand to elevate the prostate through the rectum. Other modifications were devised by Baumrucker, Creevy, Iglesias, Miller, Gibson, Scott, Willinsky, Foley, and Kirwin. The Scott, Willinsky, and Foley instruments involved the principal of rotary construction which permitted the visual system, loop, and sheath to be rotated 360 degrees without moving the high frequency inlet or light-conducting cord. The Kirwin electrotome involved the use of rotary excursion of the cutting loop.

Many accessories have been devised for use with various electrotomes or resectoscopes. The Timberlake obturator had a flexible tip which could be deflected during introduction and thereby facilitate the passage of the resectoscope sheath. The McCarthy hemostatic forceps was devised for removal of pieces of tissue from the bladder following resection, for coagulating small tumors, or for grasping or coagulating bleeding vessels through the resectoscope sheath. A variety of electrodes were designed for use with the resectoscope, known as punctate, knife, and roller electrodes. These electrodes were useful for coagulating, fulgurating, urethral meatotomy to facilitate the passage of stones, the incision of uteroceles, and the incision for destruction of cysts or adenomas at the vesical orifice. Other types of electrodes have been devised for the incision of urethral strictures.

Accessories for use with cystoscopic or endoscopic instruments such as cystoscopic forceps of many designs have been produced. These forceps are either rigid or flexible and vary in size from 5 to 11 Fr. They can be used as scissors or as rongeurs for biopsy purposes or for removal of foreign bodies from the bladder. Campbell designed a flexible scissors to provide means for slitting the ureteral orifice.

Calhoun Sterling devised a ureteral forceps with filiform tip and flexible shaft for removal of stones near the ureteral orifice. Ferguson designed a ureteral stone-removing forceps combining some of the advantages of the forceps and the stone extractor. A metal stone remover of the basket type was developed by Councill. A num-

ber of modifications of this instrument followed, in the attempt to reduce its size or simplify its construction. Those who contributed to the many modifications were Davis, Johnson, Morton, and Robinson. One type of device widely used for removal of ureteral stones is the woven ureteral stone dislodger. This instrument consists of a woven ureteral catheter with an opening in line with the axis of the catheter and a nylon cord inserted through the lumen of the catheter in such a way as to permit formation of a loop after the catheter tip has passed the stone.

A review of the development of urologic instruments would not be complete without some reference to the origin of the American woven catheters. Prior to 1930, all woven catheters used in this country were manufactured in Europe, principally in France and Germany. These were delicate, fragile, and easily broken; their coating deteriorated rapidly, and they could not be sterilized by autoclaving or boiling; their lumens were small compared to their outside diameter and the drainage properties were frequently inadequate. It was realized that these catheters might not be procurable from Europe in the event of war or other emergency, so a program of research and development was undertaken (by American Cystoscope Makers, Inc.) to produce a superior catheter.

Special machines were designed to weave the tubing and an ingenious machine was developed to weave the catheter eyes into the tubular form. Nylon was selected as the most suitable material, because it possesses great tensile strength and elasticity, it is impervious to water, and permits the formation of a woven base with a relatively large lumen. A synthetic resinous coating was developed which, when applied to the catheter and properly cured and finished, resulted in a catheter which was resistant to aging and could be sterilized repeatedly by boiling or autoclaving. After 5 years of experimental work, the first American woven catheters were produced in 1939, just prior to the outbreak of the European war. Later, all types of filiforms, bougies, and similar accessories were made available.

Another important advance in urologic instrumentation was the use of pure latex for the manufacture of various drains, urethral catheters, self-retaining catheters, and hemostatic bags. The last were first devised by Foley and many modifications were produced by Foley, Hendrickson, Higgins, Owens, Wolf, Emmett, McCluskey, Alcock, Severance, and others. The newer organic plastics, such as polyethylene and polyvinyl, have unusual properties which are particularly suited for use in many types of catheters, drains, and tubes. They do not support crystallization of urinary salts and do not tend to scale or calcify when used in the pelvis of the kidney, ureter, or bladder.

TESTS OF RENAL FUNCTION

All of us now engaged in the practice of urology have used laboratory findings so routinely in making our diagnoses that it is difficult to conceive that, only 50 years ago, none of these tests was yet available. Folin's method for the determination of nonprotein nitrogen was described in 1905, and the phenolphthalein urinary excretion test, which is really the grandfather of all specific functional tests, was not devised until 1910. Although the red dyestuff, phenolsulfonphthalein had been known since 1884, nothing much was done with it until 1909 when Abel and Rowntree showed, in animal experiments, that it was excreted almost entirely by the kidneys. This finding led to a series of investigations by Rowntree and Geraghty, which culminated in their clinical test, described in 1910. Shaw's modification, introduced in 1925, enhanced the value of the phenolsulfonphthalein test by the plotting of a curve of the percentage of dye excreted at frequent time intervals after injection.

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The advent of intravenous urography, which also serves as a functional test, has, in routine work, reduced the use of other functional tests, since if the roentgenologic medium is visualized promptly, that is, 5 minutes after injection, it is almost certain that other tests of renal function will be normal. In this way, from a practical

standpoint, the intravenous urogram serves as a screening procedure. Nevertheless, when the radiopaque medium does not appear promptly in the kidney, or the results of intravenous pyelography are unsatisfactory, renal functional tests, both old and new, are necessary to evaluate the functional state. Generally, true renal functional tests measure excretion, retention, or both.

In addition to the phenolsulfonphthalein tests, the excretion of indigo carmine is also applied widely as a functional test. Both substances are used, with ureteral catheterization, to determine the function of the separate kidneys. The specific gravity of the urine, its concentrating and diluting power, and various test meals are also used as excretion tests. The most important retention tests in urologic work are the determinations of the urea and the nonprotein nitrogen in the blood, but determinations of the creatinin and uric acid also find application in some cases. The urea clearance test, of course, determines both the excretion and retention.

With the increasing interest in endocrine and metabolic manifestations, particularly with relation to the parathyroid and the adrenal glands, other chemical determinations of the blood enter into urologic diagnostic studies. Estimations of the calcium, phosphatase, and phosphorus are important in the study of cases in which parathyroidism is suspected, and also in cases of prostatic carcinoma. Determinations of the sodium, potassium, chlorides, and sulfates also have become increasingly useful in determining the exact functional state, as knowledge has increased concerning the retention and excretion of these ions in various disease states.

Cytologic Studies

Aspiration biopsy. So-called needle or aspiration biopsies have been increasingly employed in recent years for obtaining tissue from all parts of the body for histologic examination. In the field of urology, the Silverman needle has been used principally in obtaining biopsy material from the prostate in which malignant disease is suspected. Although this method of obtaining tissue for examination has value and definite advantage when the results are positive, it cannot be relied on to exclude the presence of malignant disease, because the small amount of tissue may have been obtained from an area in which the cells were morphologically normal. A recent development is the use of a similar biopsy needle for obtaining biopsy material from the renal parenchyma. Experience with this so far has been too limited to establish beyond doubt that this procedure is entirely safe. When properly used and interpreted, needle biopsy of the prostate gland has a definite place in urologic diagnosis.

Papanicolaou stain. In 1942, Papanicolaou described a new procedure for staining vaginal smears to be used in the detection of malignant tumors of the female genital tract. Before long, this staining method was applied in similar studies on other secretions, such as the sputum and urine. In 1950, Bunge and Kraushaar reported a study on more than 200 urine specimens obtained by ureteral catheters during routine retrograde pyelography, in which the centrifugalized sediment was examined microscopically after staining with the Papanicolaou technique. In 8 cases in which there were microscopically proved malignant lesions, abnormal cells were found in the segregated urine. These authors concluded that the abnormal cells were apparently associated with renal neoplasms, but that much more study would be required before cytologic study of the urinary sediment can be accepted as a practical and reliable diagnostic test for malignant tumors in the urinary tract.

Peters applied the Papanicolaou stain to 500 specimens of prostate secretion secured by massage and described the type of cells observed in cases of prostatic malignancy. There is some question, however, as to the soundness of this procedure, since, conceivably, manipulation of the cancerous prostate might cause dissemination of the malignant cells.

At present it may be concluded that cytologic study of urinary and prostatic smears may be regarded as a screening procedure to be used in patients suspected of having malignant disease, or in the detection of early malignant cases. In patients in whom suspicious cells are found in the presence of normal cystoscopic findings and normal pyelograms, further urologic investigation is essential. Positive cytologic findings cannot be relied on to establish a diagnosis of malignant disease, but when complemented or confirmed by additional studies, they are highly significant.

Roentgenologic diagnosis

In 1905, only preliminary studies of an experimental nature had been carried out in relation to roentgenologic diagnosis of diseases of the urinary tract, although this phase of roentgenologic re-

search had interested investigators almost as soon as Röntgen's discovery was announced. As Percy Brown stated in his excellent review of the development of roentgenologic diagnosis, the very name of urinary "stone" invited research. Early in 1896, Chappuis and Chauvel had studied concretions within the structure of the kidney, both in situ and after removal from the viscus; they found that oxalatic and phosphatic stones produced shadows of the greatest density, while those of the urates were of lesser density; the shadows of uric acid stones were almost, if not quite, invisible. In June, 1896, Macintyre of Glasgow had been the first to obtain in the living individual the shadow of an intrarenal concretion, with an exposure of 12 minutes and a 6 inch spark coil. In 1897, Tuffier, in France, first attempted to determine the position of the renal pelvis and to outline the course of the ureter by means of an opaque catheter. Lester Leonard was foremost among the American workers who were interested in roentgenologic urologic diagnosis, and from 1898 to 1908 made 13 contributions to the literature. He repeatedly stressed the need of tissue differentiation, as obtained by heavy discharges through "soft" tubes, to produce shadows of proper diagnostic quality. He was confident that uric acid calculi could be so shown. Attempts were made during this period to screen the living kidney temporarily delivered at operation, but the method was discarded because of the technical difficulties involved. It was revived by others many years later.

The early effort of Tuffier with the opaque catheter was followed by the work of von Illyes (1902) and others, and in 1905 Fenwick introduced the use of the calibrated roentgenographic bougie. These methods of determining the course of the ureter were of great aid in deciding the nature of many shadows in its vicinity. Investigation of the outline of the renal pelvis was attempted by Klose in 1904, with an emulsion of bismuth.

The work that inaugurated the era of pyelography in urology was that of Völker and von Lichtenberg, which was done in 1906. They used collargol to delineate the bladder, and the solution unexpectedly filled the ureter and renal pelvis. Keyes suggested argyrol for this purpose in 1909, and described definite changes in the calyceal contour as indications of disease. In 1910, Braasch described the various types of hydronephrosis as variously recorded by pyelography. In the same year, Uhle and Pfahler advocated the use of silver oxide and, later, silver iodide as contrast media.

The development of urologic roentgenology was rapid from 1910 to 1920. In 1913, Braasch described inflammatory changes within the kidney, as shown by pyelography, and from 1910 to 1925, he made 11 reports on the roentgen anatomy, congenital anomalies, and pathology of the urinary tract. A study of the normal renal pelvis and ureter was made by Childs and Spitzer in 1913. Experiments with various contrast media were numerous in that period. Kelly and Lewis published an article in SURGERY, GYNECOLOGY AND OBSTETRICS in 1913, advocating a sodium iodide emulsion. Granger advocated oxygen in cystography and Pfahler later suggested inflation of the bladder with air as an aid in the diagnosis of vesical tumor. In 1916, Burns used thorium, and 3 years later, Young and Waters reported their studies on the seminal vesicles and vasa deferentia after urethroscopic injection of the ejaculatory ducts with this medium. Cameron, in 1918, proposed the employment of a 25 per cent aqueous solution of potassium or sodium iodide, later suggesting a 13.5 per cent solution of sodium iodide. Weld the same year advocated sodium bromide.

Other interesting roentgenologic developments were Hubeny's report in 1919 on prostatic calculi and on the necessity of their roentgenographic recognition to obviate an often unnecessary cystotomy. By 1910, Cunningham had carried out the procedure of urethrography, and he subsequently proposed the addition of highly diluted mercuric iodide to endow the radiopaque sodium iodide with higher bactericidal qualities.

The decade of 1920 to 1930 saw enormous advances in roentgenologic diagnosis in which the ground work for most of our present practices was laid; the culmination of this period was the advent of intravenous urography. The first attempt at intravenous urography was inaugurated in 1923 by Rowntree and his associates, who used sodium iodide as the radiopaque medium. During the next few years, many investigations were carried out in various countries in the search for a more suitable contrast medium. Roseno, in 1929, suggested the use of an urea-iodine preparation ("pyelognost"). The efforts of Lichtwitz, Swick, and von Lichtenberg produced from "selectan-neutral" (an iodine derivative of pyridine) a less toxic, more radiopaque deriva-

tive, "uroselectan," and this medium made possible the development of excretion urography as we know it today. From 1929 onward, this method has occupied an extremely important part in roentgenologic diagnosis of all diseases of the urinary tract. The early investigators of intravenous pyelography recognized its value as a renal function test; they also recognized the limitations of the method in certain pathologic cases, and realized that it could not entirely displace retrograde pyelography and the catheter in the determination of the source of blood and pus, or in the segregation of urine from the two kidneys. The succeeding years have seen the development of newer, less toxic contrast media, and better roentgenographic technique, which have enhanced the value of intravenous pyelography. An outstanding advantage of this method is that it can be performed in the smaller communities, where the services of a urologist may not be available for securing a retrograde pyelogram. The excretory method is of particular value in children, in whom instrumentation is difficult and sometimes dangerous, and in debilitated, poor risk patients for whom cystoscopic study is not advisable. If, however, satisfactory visualization of the kidneys is not secured because of impaired renal function, then retrograde pyelography is advisable, and sometimes mandatory.

A roentgenographic technique which has been the subject of more recent interest and study is that of nephrography following rapid injection of a large quantity of contrast medium. Vesey, Dotter, and Steinberg described the technique and their results in 1950. They differentiated three phases: (1) the arterial phase, in which the contrast medium fills the renal arteries and their branches; (2) the capillary phase, or period of maximal radiopacification, and (3) the excretory phase, during which the contrast medium appears in the glomerular tufts, kidney tubules, and then in the calyces. This procedure permits recognition of vascular anomalies and differentiation between tumors of the renal parenchyma, in which pooling of the contrast medium may be observed, and cysts of the parenchyma, which characteristically exhibit an area of translucency. In 1951, Wall and Rose presented a preliminary report of their experiences with this procedure. They had observed no adverse reactions, but listed pronounced renal insufficiency, known allergy, or inadequate veins to permit venipuncture with a 15 gauge needle as contraindications. This procedure has not yet been generally accepted because there is considerable skepticism about the safety of injecting a large quantity of contrast medium so rapidly. This cautious attitude will be affirmed or dissipated as experience with the method accumulates.

In 1921, Carelli and Sordella and Rosenstein almost simultaneously introduced the procedure of perirenal insufflation of oxygen in the study of the kidney, but this did not meet the immediate wide acceptance that was accorded to excretory urography, and experimentation with the latter for a time overshadowed the possible usefulness of air and gas injection techniques. After the early reports by Carelli, Rosenstein, Quinby, and others, general acceptance was delayed, partly because bilateral visualization necessitated separate injections for the two sides, and partly because instances of fatal air emboli were reported. Interest in the method, however, was renewed with the demonstration by Langeron, in 1929, that intraperitoneal air would disclose a large adrenal tumor on a roentgenogram. The increasing interest in adrenal tumors of all types, and the increased frequency of their surgical treatment led to more widespread use of perirenal insufflation, and refinements in technique (among them, careful control and timing of the injection of air, oxygen, or carbon dioxide) increased the safety of this procedure in the diagnosis of these tumors. Cahill, in 1935, made the first report on the use of air insufflation to verify suspected adrenal disease. He later (1944) listed contraindications to this procedure as follows: acute infections in the region to be injected, evidence of large renal tumors, with the possibility of marked superficial venous hypertrophy and the possibility of fascial plane malignancies, such as retroperitoneal lymphosarcomas with adhesions and vascularity. It is Cahill's opinion that all cases of air embolism, if carefully investigated, will show that bleeding was present and that often air was injected into a person in whom its use was contraindicated. Most emboli occurred at the hands of those unfamiliar with the technique and its indications and contraindications. Cahill cited over 500 injections without complications or fatalities. Recent reports on perirenal insufflation were presented in 1953 by Godlowski of Edinburgh, who described a technique which minimizes complications, which he says are due chiefly to vasovagal syncope (vascular stretch reflex) or mediastinal emphysema; in 1954 Joel-

son and his associates described 7 cases of adrenal tumor demonstrated by this technique. During the past few years, Riva's technique of presacral insufflation, introduced in 1948, has had wide acceptance. This permits visualization of both kidneys and the adrenal glands as the gas migrates upward in the retroperitoneal space. More than 1,500 air insufflations have been performed by this technique with an exceptionally low mortality and morbidity.

A relatively recent development in roentgenologic diagnosis is the so-called pneumostratigraphy, in which air insufflation methods are combined with tomography. Its application to urologic diagnosis was reported in Italy in 1953 by Camerini and his associates; the bladder walls were studied after extraperitoneal air injection by an anterior prevesical approach. An advantage of this combined technique of studying the bladder wall and demonstrating the extravesical spread of tumors is the almost complete elimination of gas and opaque shadows due to superimposed intestinal contents or insufflated air.

Renal Aortography

In 1929, dos Santos, Lamas, and Caldas first described their technique of injection of the abdominal aorta, to delineate the arterial circulation. The toxicity of the early contrast media slowed the acceptance of this procedure in clinical urology. In 1931, dos Santos and his colleagues had perfected their technique and were employing iodine compounds of low toxicity. The subsequent development of diodrast and other less toxic radiopaque substances has made renal aortography a definite feature of the urologic diagnostic armamentarium during the past few years, for it gives invaluable preoperative information concerning the vascular supply of the kidney in question. Acceptance of aortography by urologists has been stimulated in the United States by the work of Döss, Nelson, and Smith. In 1954, Smith reported that he had performed more than 1,000 renal angiograms with no mortality and without severe morbidity. Campbell, however, has cautioned: "Lest the reader gain the notion that lumbar aortography is a benign procedure, it should be noted that in several clinics where the method has been liberally employed, there have been many instances of grave morbidity and some deaths from its use."

This diagnostic method is of value in differentiating various types of renal lesions, such as cysts or neoplasms of the renal parenchyma, congenital hypoplasia of the kidney, and congenital renal aplasia. When surgical intervention is contemplated for horseshoe kidney or other types of fused kidney, or in the hydronephrotic kidney, accurate knowledge of the vascular pattern and of the presence or absence of an adequate blood supply to the diseased kidney is made available. This information may frequently be the determining factor in deciding whether reparative surgery or nephrectomy is the preferable procedure.

PREOPERATIVE AND POSTOPERATIVE CARE

Realization of the importance of proper care of patients before and after operations in influencing the surgical results is a relatively recent development, and practically all our modern concepts have evolved during the past 25 years. The first decades of the era of modern surgery, ushered in by the discovery of bacteria and antisepsis, were characterized principally by the devising of new operative procedures, and of improvements in surgical instruments and in the technique of the surgery itself. In their zeal to explore new fields of surgery and to attain technical skill in the manipulation of living tissue and the excision of pathologic lesions, the pioneer surgeons gave relatively little attention to the importance of the patient's functional state at the time of operation and of the care he received afterward in influencing the results of surgical treatment. It must be remembered, however, that these early surgeons did not have the precise knowledge we now have—and we ourselves are learning new facts each year—about the body's chemistry and its disturbances in various disease states. Nor did the surgeon of 1905, or before, have an armamentarium of laboratory tests to aid him in making his diagnosis or in appraising the functional state of the kidneys, as well as knowledge of the vital electrolyte and fluid balance. It is small wonder, then, that the morbidity and mortality attending all major urologic procedures were exceedingly high. From the viewpoint of our own relatively advantageous position, it is rather more surprising that any patients recovered, or even survived.

Preoperative and postoperative care are even more important in urology than in some other fields of surgery, because any disease of the urinary tract which interferes with excretion and elimination of urine in itself affects profoundly

devoted, during the early years of this century, to isolation of various organisms from urine cultures. These studies showed that the most important organisms clinically were the gonococci, streptococci, colon bacilli, and the Proteus organisms. Later, the urea-splitting ability of various organisms received increasing attention.

Fifty years ago, practically the only urinary antiseptic of any value was methenamine or urotropin, and its bacteriostatic effect had been proved to be due to the liberation of formaldehyde, by Nicolaier. In 1912, Burnham found that liberation of formaldehyde by different individuals varied greatly, and, in 1913, Hinman demonstrated that the action of formaldehyde against bacteria was indefinite, unless the drug was given in tremendous quantities, and that it was more effective in the bladder than in the kidney. Later experimental work on methenamine and its derivatives was published by Shohl and Deming (1920), Thomas and Wang (1929), Vermooten and Berry (1933), and many others. Neoarsphenamine also was the subject of study as a urinary antiseptic because formaldehyde was found to appear in the urine following its use.

Davis and White, in 1918, published results on the intravenous administration of acriflavine and proflavine, showing that both were efficient against staphylococci and colon bacilli in high dilution in alkaline urine. The previous year (1917) Shohl and Janney had demonstrated the importance of *p*H in urinary infections by finding that colon bacilli were inhibited in the urine with a *p*H between 4.6 and 5.0.

The use of mercurochrome intravenously in severe urinary infections was reported by Young and Hill in 1924, and subsequently, until the sulfonamides were introduced, many urologists confirmed their work. In 1931, Clark noted that urine containing ketone bodies was bacteriostatic, and Clark and Helmholz described the effectiveness of the ketogenic diet in eradicating bacillary infections in the urinary tract. Mandelic acid received some attention as a urinary antiseptic around 1935.

In 1937, Helmholz reported the successful use of sulfanilamide in urinary infection, and Reuter, and Dees and Coulter began using this drug in the treatment of gonorrhea the same year. The startling results reported in the control of urethral discharge and control of the infection led to widespread use among urologists within a very short time. The subsequent introduction of sulfapyridine, sulfathiazole, sulfadiazine, and other sulfonamides ushered in the new era of chemotherapy. And then came the antibiotics! Penicillin, aureomycin, terramycin, chloramphenicol, and bacitracin appeared in rapid succession, and more new preparations and combinations are being developed constantly.

However, despite these wonder drugs the problems of urinary infection are by no means solved. Each discovery uncovers new problems and creates still others. We all have experienced the frustrations of resistant strains of bacteria, patients previously sensitized to an effective drug, disappointing results with chemotherapy or antibiotics unless stasis and obstruction are corrected, and other difficulties.

Present studies are concentrating on these problems, and progress in the control of infections is resulting from various approaches: (1) increased appreciation of the role of complicating factors, e.g., obstructive lesions associated with urinary stasis, and the presence of calculi; (2) improved methods for isolation of specific bacteria and more precise sensitivity tests to the various drugs; (3) introduction of new antibiotic preparations to replace those to which bacteria have developed resistance; (4) more careful clinical study and more accurate diagnosis of the type of infection, so that antibiotic therapy may be administered more rationally in the individual case; (5) appreciation of the importance of adequate dosage of the drug selected and of administration for a sufficient period, especially when pyelonephritis is present; and (6) greater appreciation and awareness that the antibiotics represent a two-edged sword, which may bring their own complications, such as monilia infections, inflammatory lesions of the intestinal tract, anaphylactic reactions (sometimes severe and even fatal), agranulocytosis, thrombocytopenia, and even hemolytic anemia. Additional progress in therapeutic management will result from current studies of tissue reactions to bacteria of various types, the role of the adrenal glands and other organs in responding to the stress of infection, the ultimate evaluation of cortisone and ACTH in the therapy of inflammatory infectious processes, additional knowledge of the ecology of bacterial flora within the body, and the effect on this symbiasis of chemotherapeutic and antibiotic agents.

A word should be said, perhaps, about focal infection and its role in urology, both in theory

and in practice, i.e., as it concerns the localized infections dealt with by the urologist. In the early decades of this century, the impact of focal infection was tremendous in all fields of medical research and practice, and kidney and bladder infections, particularly, were exhaustively studied as infections resulting from distant foci, and the prostate gland was regarded as a locus of residual infection that resulted in lesions elsewhere in the body. Although focal infection has lost its vogue at present, and emphasis has shifted to individual susceptibility, antigenic reactions in tissue, collagen diseases, and the stress factor, the final evaluation of focal infection remains to be made. Whether it is ultimately accepted as having some validity, or rejected entirely, it certainly played a dominant role in therapeutic concepts for a considerable period, and led to much useful investigative work in all types of infections, and to improved treatment methods in many fields. In this way, it forged a link in the eternal chain of medical progress.

ANESTHESIA

The history of the development of anesthesia, which has contributed so much to the progress and safety of twentieth century surgery, including urologic surgery, would be a book in itself, if all notable contributions were to be mentioned. In an article of this type, one can do no more than contrast the anesthesia of 1905 with that of 1955, to indicate the enormous advances that have occurred during this 50-year period.

In 1905, cocaine was receiving widespread clinical trial, both as a local anesthetic and in spinal injections, but its toxicity resulted in a reaction of disillusionment and caution, which prevailed until less toxic agents were developed. Einhorn described procaine in 1904, and it was just beginning to receive clinical trial in this country in 1905. The development of this and other derivatives of cocaine (new ones are constantly being introduced) gave great impetus to studies of spinal anesthesia, which through the years has undergone continuous refinements of technique to become the precise, fine art that it is today. Spinal anesthesia, as was promptly demonstrated by Chute, Lowsley, Young, Hunt, and others, is especially valuable in urologic operations, which often must be performed on elderly patients in whom the risk of complications is increased. Spinal anesthesia decreases the danger of pulmonary complications in these debilitated subjects and is the preferred procedure of many urologic surgeons in open operations on the prostate gland, bladder, ureters, and kidney.

Although sporadic attempts at intravenous anesthesia had been made earlier with hedonal, hedonal and chloroform, ether and chloroform, paraldehyde, alcohol, and other substances, each was abandoned in turn until the advent of sodium amytal, which was first used intravenously as an anesthetic by Zerfas in 1929. Evipal was introduced in 1932, and Lundy, in 1935, published the first report on the use of pentothal sodium intravenously, which is still widely used; in fact, it is the anesthesia of choice in most surgical procedures involving the use of the cystoscope.

Other injection methods of anesthesia have all been developed during the past 50 years. According to Young, paravertebral anesthesia was originated by Sellheim in 1905, and was first used in urologic surgery by Kappis in 1912. Heinrich Braun, who had done much to stimulate interest in local anesthesia with his book which appeared in 1905, also was the originator of parasacral anesthesia in 1914. Caudal block anesthesia was first successfully used in patients by Stoeckel in 1909. Danis introduced transsacral anesthesia in 1914.

Developments in general anesthesia during the past 50 years have been no less spectacular. In 1905 practically all major operations were performed under ether or chloroform anesthesia. Experimentation with ethylene by Kretschmer, Luckhardt, Brown, and others led to its use as an anesthetic agent early in the 1920's. Work on carbon dioxide by Henderson, Haggard and Coburn, and by White demonstrated that it was an aid to the induction and elimination of anesthesia. The combined gas inhalation anesthesia used everywhere today was first described by Lundy in 1924, who constructed an apparatus giving four-way control for the administration of measured quantities of oxygen, nitrous oxide, ethylene, and carbon dioxide. The refinements of apparatus of this type, improvements in the technique of administering anesthetics, and the training of skilled anesthetists have led to the high degree of confidence that surgeons now enjoy regarding the effectiveness and safety of anesthesia in all types of operations.

There is no type of anesthesia, general, regional, or combined, that does not find applica-

tion in urologic surgery, and the use of certain methods for special purposes has brought further refinements that contribute to the safety, comfort, and early recovery of patients undergoing operation.

SURGICAL TREATMENT

General Considerations

Although many of the major surgical procedures now used in urology had been devised by 1905, most of them have been constantly modified and revised so that now they are quite different procedures, and the practice of surgical treatment of the genitourinary tract, as we know it, was developed almost entirely during these last 50 years. To realize that this is true, we have only to imagine what it would be like to practice urologic surgery without x-ray diagnosis, without functional tests or other laboratory determinations, without any idea of fluid and electrolyte balance or of the importance of certain ions, such as calcium, sodium, and potassium, without knowledge of vitamin or protein deficiency, without modern wide vision cystoscopes or instruments for endoscopic operations, without parenteral fluids and blood transfusions, without modern sedative medication, without spinal, intravenous, or controlled gas inhalation anesthesia, without a wide range of suture material, without satisfactory methods for decompression of the bladder, without effective chemicals and antibiotics to control infection, without hormones to regulate metabolic disturbances, without oxygen for emergencies—in short, without everything, practically, that we consider absolutely essential in performing our work. The mere listing of these essentials, all unavailable to the surgeon of 1905, brings added respect for the men of that day who were breaking the trail for us who took up the scalpel and cystoscope a bit later. They had to be not only brilliant but very brave men to operate on the kidneys, ureters, and bladder, and even the prostate gland. For severe operative morbidity and a high mortality were inevitable in all operations on the genitourinary tract.

As already outlined, urology advanced as progress was made in roentgenographic and laboratory diagnosis, as instruments were refined and perfected, as anesthesia became better and safer, as infection became easier to control, and as more effective supportive treatment was administered before and after operation. Along with all these advances, urologic surgical technique has been constantly improved.

These factors quite naturally led to the development of more extensive surgical procedures, especially in the treatment of malignant disease. Unfortunately, in their enthusiasm for overcoming technical difficulties, some surgeons seem to have lost sight of the attendant morbidity, the economic burden to the patient, and the futile hope of producing a cure in many instances. At present, many of us are questioning the wisdom of such radical extirpation of tissue, and additional critical evaluation is mandatory to determine whether the end results justify operative procedures of such tremendous magnitude.

No organ in the urinary tract is immune to complete removal. The kidney, periaortic glands, and adjacent fat may be removed for tumors involving the renal parenchyma. Nephrectomy, ureterectomy, and excision of a segment of the bladder adjacent to the ureteral orifice is the procedure of choice for neoplasms involving the renal pelvis. In selected cases, a cystectomy, prostatectomy, seminal vesiculectomy, and pelvic lymphadenectomy, with diversion of the urinary stream, is advocated for carcinoma of the bladder. Perineal prostatectomy with seminal vesiculectomy is recommended for carcinoma of the prostate diagnosed early in the course of the disease.

Even though procedures of this type are recommended in the treatment of malignant disease of the urogenital tract, it is well to appreciate that in certain cases, when diagnostic study has determined that the lesion is beyond the range of surgical cure, there is no justification for subjecting the patient to a drastic operation and its attendant morbidity. With experience, the range of operability is widened, but it should never be forgotten that, though the extensive procedure may attest to the skill and dexterity of the surgeon, it is also an index of his surgical judgment. And the latter is certainly as important, if not more so, than the former in the achievement of good surgical results.

Except in eradication of malignant disease, the general trend in urologic surgery has been toward conservatism, especially in the conservation of renal tissue. Contrary to general belief, this is not a brand new phase, because a progressing trend toward conservatism has been evident for many years. For example, in 1933 Bugbee

commented that advances during the previous decade and the general trend could best be summed up in one word, conservatism. The conservative approach in renal surgery has been influenced by contributions on renal function, visualization of the arterial pattern, pyelography, refinements in surgical technique, and the introduction of the newer antibiotics.

A continuation of the trend toward more physiologic surgical procedures may be expected, since new facets are being uncovered constantly in regard to functional interrelationships of the kidneys with other organs of the body. This trend may be further enhanced by additional developments and improvements of instruments for transurethral procedures, which will increase their scope and add to the general conservative trend in surgical treatment.

Renal Surgery

The beginning of modern renal surgery dates back to 1869, when Gustav Simon performed the first nephrectomy. Nephrolithotomy was first done by Morris in 1880, and, in 1896, Beck removed a renal calculus by pyelotomy. Others, like these pioneers, also performed considerable renal surgery during the late nineteenth century, but, from the standpoint of routine medical practice, these operations were still relatively rare 50 years ago, because of the formidable risks involved in any surgical attack on the kidneys. The importance of conservation of renal tissue was demonstrated very early; however, in a comprehensive review in 1901, Von Schmieden was able to collect 34 partial resections and 1,118 complete extirpations of the kidney. The total nephrectomies were followed by a mortality of 27 per cent and the 34 partial resections, by fatal outcomes in only 11.8 per cent. Twenty years later (1921), Berti collected 112 cases of resection of the kidney with 11 deaths—about the same mortality.

In 1905 the kidney operations most often performed were probably nephropexy and decapsulation, but by 1915 many surgeons in this country were attempting more formidable procedures, and contributing, bit by bit, to the technique, so that at present most of the more important operations are quite well standardized. In a review of this type, it would be impossible to list all the technical contributions of importance during the past 50, or even 25, or 10 years, and only a few names of the men who made these contributions can be mentioned. These include, among many, many others, Mayo, Young, Lower, Cullen, Burns, Lowsley, Prather, Counseller, Hunt, Cabot, Quinby, Foley, Priestley, Hinman. In a subject so vast as renal surgery, it is possible here to note only a few of the more recent contributions and to evaluate present trends.

In recent years, as has been indicated in the foregoing sections, stress has been laid on accuracy of diagnosis, investigation of renal function, depletion states in patients, electrolyte and water balance, and, at present, adequate preoperative and postoperative management is receiving increasing attention. These features, combined with the refinements in surgical technique and the use of antibiotics, have enormously increased the scope of conservative renal surgery. In the past few years, potassium deficiency has, especially, received more careful attention. It is now realized that potassium deficiency may occur in patients whose fluid intake is inadequate, in those with diarrhea and in individuals receiving nasal suction, and that this may greatly complicate the postoperative course. The electrocardiogram is now utilized to reveal changes indicative of a drop in serum potassium below 2 milliequivalents.

Hydronephrosis. Hinman's work on hydronephrosis, which was begun in 1918, represented a major contribution to urology, and has influenced modern concepts of surgical treatment. Kelly, Young, Mayo, Quinby, and Foley also made important contributions in this field. The first experimental procedures for plastic operations were performed before 1900 (Young cites Küster as having performed the first successful plastic operation for hydronephrosis in 1891), but widespread use of the conservative plastic operation is a development largely of the last decade or so, because the antibiotics have greatly contributed to the safety of these operations. Hence, the conservative trend is nowhere more evident than in operations for hydronephrosis. Numerous technical procedures are used, since the cause of hydronephrosis is variable, but the majority of cases is associated with ureteropelvic obstructions. It is essential that the urologic surgeon be familiar with all plastic techniques, however, because all anatomic variations may be encountered, and each requires a different type of operation for its correction. In former years, if an anomalous vessel appeared to be

instrumental in the production of the hydronephrosis, it was merely divided and ligated, unless it was the source of blood supply to a considerable portion of the renal parenchyma. Now it is generally accepted that the search for the cause of the hydronephrosis is never complete unless the renal pelvis is opened for careful inspection of the ureteropelvic junction.

One of the most common anatomic abnormalities associated with hydronephrosis caused by obstruction at the ureteropelvic junction is the presence of anomalous blood vessels which course to the lower pole of the kidney. An aortogram secured before operation may disclose the amount of renal parenchyma supplied by an aberrant artery and provide information as to whether the vessel may be safely ligated. The aortogram will also reveal the renal arterial pattern, which may be the determining factor in the decision as to whether reparative surgery is feasible or whether nephrectomy will be required.

Certain technical procedures and methods have been more or less standardized in connection with surgical treatment of hydronephrosis, but some points, such as whether nephrostomy tubes and splints are necessary, are still moot. Most surgeons still advocate their use, but lately gratifying results are being reported which imply that they are not essential. Additional observation and experience will be necessary for final evaluation.

Nephropexy. The changed attitude toward nephropexy has been summed up by Wharton as follows: "Nephroptosis was once given a significance long since discarded; consequently 50 years ago, in this clinic, nephropexy was the commonest urologic operation. For the past 35 years nephropexy has almost never been performed except when the nephroptosis has been proved to be causing pain, urostasis, hydronephrosis or perpetuating an infection." Although opinion still varies somewhat as to the value of nephropexy, certainly this conservative attitude is consonant with the views of the majority of urologists.

Dialysis. The value of dialysis in the treatment of anuric patients with renal lesions, especially in acute glomerulonephritis known or thought to be reversible is well recognized. Two methods of extrarenal diffusion have been developed: peritoneal lavage and the artificial kidney introduced by Kolff, in 1946. While both methods are theoretically attractive in certain situations, actual results to date are difficult to evaluate. Too few patients have been treated with either method, and it must be remembered, furthermore, that about 50 per cent of patients with acute glomerulonephritis recover spontaneously. The likelihood of complicating peritonitis with peritoneal lavage and the dangers inherent in the use of heparin as part of the procedure employing the artificial kidney should not be overlooked. Although the artificial kidney is one of the most dramatic contributions of the present decade, its promiscuous use, of course, is not to be sanctioned, even in institutions where a skilled team is at hand to administer the treatment.

Kidney tumors. Interest in renal tumors, by 1905, was beginning to be widespread, for the previous decade had seen considerable study of these lesions, especially by Europeans, such as Grawitz, Lubarsch, and Israel, which had culminated in the monograph by Albarran and Imbert, published in 1903. Wilms's tumor was first described in 1899. Garceau published a monograph on renal tumors in 1909, suggesting certain changes in the classification then accepted. Numerous contributions on the pathology of renal tumors were made by Ewing, Kaufman, McCallum, Wilson, and Bothe. The Mayo group, including Judd, Mayo, Hunt, Broders, Braasch, and Scholl, were particularly active in the clinical investigation of neoplasms of the kidney. Barney published an important paper in 1913. Later, outstanding contributions were made to this field by Kretschmer, Gibson, Voelker, Meltzer, Hyman, and many others.

Hyman, in 1928, showed in a collective review of 99 cases that only 15 per cent of renal tumors were cured by nephrectomy. Hunt, in 1927, stressed the importance of complete nephroureterectomy at the primary operation, and in some cases, removal of a considerable portion of the bladder wall involved in the tumor at the lower end of the ureter in patients with tumors of the renal pelvis. Kimball and Ferris, in 1934, reviewed 74 cases of papillary tumor of the kidney in which the kidney, ureter, and bladder were involved.

This propensity of tumors of the renal pelvis to spread down the ureter and to involve the ureteral orifice and even the bladder naturally stimulated interest in more extensive surgical procedures in order to eradicate this disease,

and the magnitude of such operations has been increasing through the years. With the numerous corollary advances that have contributed to the safety of surgery during the past decade, it is not surprising that the zeal for "big" operations increased greatly during the late 1940's. Certainly, the recognition of the influence of involvement of the renal vein and its tributaries in cases of renal tumor has been a fundamental contribution to urology and has greatly influenced the surgical technique involved in the performance of nephrectomy for renal neoplasms.

In earlier years, nephrectomy by the lumbar route for parenchymal tumors was the usual procedure. Later, many advocates for transperitoneal nephrectomy appeared. This procedure was recommended on the basis that in approximately 52 per cent of the neoplasms of the renal parenchyma, the main renal veins or their tributaries were involved by tumor thrombus. In 54.6 per cent of the cases of carcinoma of the renal pelvis, a tumor thrombus involves the main renal vein, its tributaries, or the perirenal lymphatics. From the prognostic standpoint, it is evident that the fact that the renal vein is or is not involved in the malignant process should exert considerable influence on the end results, and similarly influence the technique of nephrectomy for malignant tumors of the kidney. It is now firmly established that the vascular pedicle of the kidney should be ligated, before manipulation of the kidney, which ligation will minimize the dissemination of tumor cells through the venous system. Numerous pathologists have contributed observations leading to these concepts, and certainly their work cannot be too highly praised. In view of the frequency of perirenal lymphatic node and periaortic involvement, such involvement and the contiguous fat tissue should be removed with the kidney.

From 1940 to 1950, there was increasing emphasis on the value of the transthoracic technique of nephrectomy for neoplasms of the renal parenchyma, and some surgeons have adopted this approach entirely, replacing the transperitoneal or lumbar operation. Like the transperitoneal operation, this technique permits ligation of the vascular pedicle prior to manipulation of the involved kidney, and makes possible a more radical removal of glands and contiguous fatty tissue. At present, there is a wave of enthusiasm for this technique, as advocated by Chute in 1949. It seems questionable, however, whether this procedure should be employed in all cases, and many urologic surgeons still prefer the usual lumbar or transperitoneal approach. Use of the transthoracic approach for nephrectomy, however, emphasizes that intensive training in general surgery is an essential prerequisite to specialized training in urology.

Another approach for nephrectomy, the dorsolumbar, has been recommended by Nagamatso (1950). In this procedure, subperiosteal resection of segments of the tenth, eleventh and twelfth ribs is done, to avoid traversing the thoracic cavity. So far, experience with this technique has been insufficient to warrant evaluation as to whether this approach is suitable in all cases of renal neoplasms.

Since 1926, when Bothe found that Wilms's tumors were radiosensitive, most of the literature on these lesions has been concerned with comparisons of irradiation and surgery and combined treatment, and how the latter should be administered. Throughout the years, nephrectomy has remained the procedure of choice, but some controversy still exists as to the value of preoperative roentgen therapy. Ladd and White advocated the immediate removal of the kidney, utilizing the transperitoneal approach, because they believe preoperative roentgen treatment necessitates dangerous delay. It appears, however, that the majority of urologic surgeons at present prefer both preoperative and postoperative irradiation of patients with Wilms's tumor, although evidence is still inadequate for standardization of the treatment. Individualization seems to be the best policy, and preoperative irradiation depends upon the size of the tumor and whether or not the vascular pedicle may be ligated prior to manipulation of the involved kidney.

As the last 50 years have elapsed, we have constantly gained a clearer concept of the behavior of renal neoplasms, the means of dissemination of the tumor from its initial site in the kidney, the role of the lymphatics in this spread, and the classification of certain renal tumors with respect to their radiosensitivity. A recent development of the past decade, which is a major contribution in the diagnosis of malignant lesions of the genitourinary tract, is the introduction of the Papanicolaou stains and their application to the examination of urinary sediment.

Each addition to pathologic knowledge and each improvement in surgical and radiation therapy technique has resulted in improved methods in the diagnosis and treatment of renal neoplasms, and further knowledge is eagerly awaited by the urologists in their constant battle against malignant disease. Earlier recognition of malignant disease in the urinary tract, as elsewhere, is essential, if treatment results are to improve. Clinical appreciation of the gravity of hematuria would aid in earlier recognition of many genitourinary neoplasms, and this point should be repeatedly stressed, especially by urologists, in the medical literature.

Renal lithiasis. The treatment of patients with renal calculi and stones in the ureters and bladder has always occupied a prominent place in urologic practice. By 1890, the surgical treatment of renal calculus was already well established. By 1905, the technique of nephrostomy was being influenced by the experimental findings of Broedel, who had demonstrated in 1901 a zone in the kidney comparatively free from blood vessels, lying immediately beneath a line parallel and slightly posterior to the lateral convex border. In 1909, Cullen and Derge described a technique in which the kidney was bisected by a silver wire along the supposed avascular zone, in an effort to control hemorrhage. Later it was found that vessels of the kidney pedicle could be clamped for a short time without impairment of renal cortical tissue. Hemorrhage and the finding of all stones or calculous fragments were the principal problems of nephrostomy, and many of the changes in surgical technique which were advanced from 1905 to 1925 were devised in the attempt to overcome these difficulties. Mayo (1912) and Lower (1913), and many others described procedures for the removal of kidney stones. Use of roentgenography for the localization of calculi during operation was advanced by Burns (1917), Braasch and Carman (1919), and Quinby (1925). Lowsley and Bishop introduced their ribbon catgut method for closure of extensive nephrotomy wounds in 1933. Other contributions to the surgical technique of operations for kidney stones were made by Counseller and Hoerner, Braasch, Higgins, and Hinman.

During the early decades of this century, interest was extremely lively also in endoscopic procedures for the removal of urinary stones. Young had published the report of a case in which a stone protruding from the ureter had been removed by a bougie passed through the cystoscope, in 1902. New instruments for seizing and crushing stones through the cystoscope appeared in great profusion, especially after McCarthy's foroblique cystoscope was introduced in 1923. Councill, using the stone extractor he described in 1926, was especially well known for his removal of stones in this manner. Others who made contributions in devising new instruments were mentioned in the section on instruments.

During the past 20 years, the principal contributions on the treatment of renal calculi have not been those due to refinements in surgical technique (though there have been many such), but those that have contributed to a clearer understanding of the etiologic factors associated with stone formation, particularly with recurrent stone formation following removal of a calculus from the kidney. The knowledge that renal lithiasis is a general medical problem involving endocrinologic, bacteriologic, chemical, dietetic, and metabolic factors has led to profound changes in the diagnosis and treatment, which will assume even more prominence in the future and will constitute a fertile field for experimental and clinical research. The facts so far learned already constitute a large area of special knowledge which can only be hinted at here.

Advances in the treatment of renal lithiasis during recent years have come about largely through conservatism and the reduction of morbidity by minimizing the recurrence of stones. It seems evident that no single factor is responsible for the various types of renal calculi. In 1936, Higgins listed the following etiologic factors as requiring investigation before operation: vitamin A deficiency, poorly balanced diet, focal and local infection, metabolic diseases, hyperparathyroidism, immobilization, stasis, hyperexcretion, and deficiency of protective colloids in the urine. A thorough study of these factors permits correction or eradication prior to operation, during the operative procedure, or during the period of postoperative observation.

Here tribute must again be paid to the newer antibiotics. Eradication of infection in the kidney following the surgical removal of a calculus has been of inestimable value in reducing the incidence of recurrent lithiasis.

In the last few years, attention has focused also on the role of protective colloids in prevent-

ing stone formation. Butt, Hauser, Seifter, and Perry have advocated the use of hyaluronidase and have presented glowing accounts of its beneficial results. Others who have used this method have been disappointed in its effects. It does, however, introduce a new avenue of approach, requiring critical evaluation.

In a series of publications during the 1930's, Higgins discussed the role of diet in the dissolution of certain renal calculi, and stressed the importance of this factor in the postoperative regimen. The diet used in the individual case is selected according to the chemical constituents of the calculus. High vitamin A, and acid-ash, or alkaline-ash diets are prescribed, according to the indications.

Suby and Albright, in 1943, published their method of treatment of calcium stones by means of a citric acid mixture; their previous experimental work had shown that citric acid mixtures would disintegrate calcium stones not only because of their acid reaction, but also through the formation of a complex calcium-citrate ion. Subsequent to the introduction of the "buffered" citrate solution, solutions "G" and "M" were introduced by Suby. Keyser, Scherer, and Claffey (1948) suggested the use of enzymes, such as urease, to attack the organic matrix of urinary stones prior to irrigation with solvent solutions.

Another medical approach to the treatment of renal lithiasis was suggested by Schorr, in 1945, i.e., the use of estrogens and aluminum hydroxide gels, based on the rationale that estrogenic hormones augment the secretion of citric acid and reduce that of calcium. This is recommended as an adjunct in the management of stones composed of calcium phosphate, magnesium-ammonium phosphate, or calcium magnesium-ammonium phosphate.

The recognition of nephrocalcinosis as a disease entity, in which numerous small calcifications are distributed throughout the renal parenchyma, to which notable contributions were made by Lightwood (1935), Anderson (1939), Butler, Wilson, and Farber (1936), and Albright and his colleagues (1940), is one more factor which underlines and clearly illustrates the general medical problem presented by renal lithiasis. Although surgical intervention may be required to remove a calculus impacted in the ureter in some cases of nephrocalcinosis, medical treatment is essential to relieve the acidosis, reduce the hyperchloremia and hypercalcinuria, and to improve the absorption of calcium.

It seems likely that the necessary surgery in cases of renal lithiasis will tend increasingly toward conservatism, and that procedures such as calicectomy and heminephrectomy will be performed more frequently on patients who formerly would have been subjected to nephrectomy. However, the outstanding contributions in the management of kidney stones will come from further clarification of the etiology of stone formation, improved methods for the dissolution of calculi, and the institution of prophylactic corrective measures to minimize recurrences following operation.

Renal tuberculosis. Since the inception of urology as a specialty, tuberculosis of the kidney has been recognized as a serious clinical problem, and much of the early work on nephrectomy was done in tuberculous cases. The early authors, including Albarran (1905), Israel (1911), and Legueu (1915), tended to regard renal tuberculosis as a local manifestation and believed that only 10 to 20 per cent of the cases were bilateral, even though autopsy studies and experimental studies on animals demonstrated a much higher proportion of bilateral involvement. With improved methods of diagnosis, there has been increasing clinical recognition that both kidneys are attacked in at least 50 per cent of the cases of renal tuberculosis.

The concept, now generally accepted, that renal tuberculosis is a local manifestation of a generalized tuberculous infection, was evolved by much painstaking study by many investigators from the anatomopathologic, clinical, surgical, pathologic, and experimental standpoints. Among those who made valuable contributions were Walker (1911), Rafin, (1914), Chute (1920), and Medlar (1926). The hypothesis of Lieberthal, published in 1938, has been widely accepted. This postulates that invasion of the kidney is by blood-borne organisms which cause lesions in both kidneys at the same time and in several places, many or all of which may heal. A single remaining focus may finally erode the epithelium and discharge bacilli into the urine, but this may remain undiscovered because at this stage there are no urinary symptoms. Some bacilli lodge at the apex of a papilla and form a small ulcer. Adjacent arteries may be eroded and produce miliary seeding of the cortex. Edema and stricture

of the ureter result from bacilluria, causing stasis and reimplantation on other papillae. Cystitis eventually follows the continual flow of bacteria and bacterial products. Retrograde infection of the kidney from the bladder by ureteral reflux or regurgitation has also been demonstrated experimentally by numerous workers.

Although, before 1900, numerous more conservative procedures were recommended for renal tuberculosis because of the high mortality associated with nephrectomy, during the first decade of the twentieth century improvement in the results of complete removal of the kidney led to eventual widespread acceptance of this procedure in the treatment of tuberculosis. For example, in 1902 Pousson reported a mortality of 28.3 per cent following nephrectomy, and Wildbolz in 1913, reported deaths in only 2.8 per cent. Later, Beer and Hyman reported a 3.8 per cent mortality in 1920, and Barney reported 3 per cent, in 1925. In 1926 Young reported 111 cases with no deaths, although the one hundred and twelfth patient died, and Caulk reported a series in 1936 with 0.7 per cent fatalities.

Surgical technique from 1910 onward was largely concerned with attempts to prevent the formation of postoperative sinuses, and numerous surgeons, including W. J. Mayo (1915), Keyes, Kelly, Caulk, Howard, and Beer, have made contributions to this problem. All authors have emphasized the value of nephrectomy in clinically unilateral renal tuberculosis, although Persson, Rafin, Judd and Scholl, and others, showed that nephrectomy never brings a cure when both kidneys are affected, nor even prolongs the life of the patient.

The picture in renal, as well as in all other types of tuberculosis, was changed materially by the advent of streptomycin, in 1944, which was shown by Schatz and Waksman to have a pronounced bacteriostatic and bacteriocidal effect in vitro against the human strain of M. tuberculosis. The combined administration of streptomycin and para-aminobenzoic acid (PAS) has now been well standardized, and is used alone or in conjunction with appropriate surgery in all types of tuberculosis. Nephrectomy remains the procedure of choice for renal tuberculosis, but its results have been vastly enhanced by preoperative and postoperative chemotherapy. In the past few years, isonicotinic acid hydrazide (isoniazid) has been added to the medical armamentarium, and undoubtedly more antituberculous drugs will be found in the future. The value of sanatorium care, especially in the early and critical stages of renal tuberculosis, cannot be overemphasized.

Renal hypertension. The association of hypertension with renal disease has long been recognized, and early experimental studies were reported by Janeway in 1909 and Prinzmetal and Friedman in 1910. Later, Cash (1924) and Wood and Ethridge (1933) produced hypertension in experimental animals by various methods involving kidney injury, and Harrison, Blalock, and Mason produced hypertension with extracts from normal and diseased kidneys, in 1936.

Prior to 25 years ago, it was believed that lesions of both kidneys were invariably present in cases of hypertension of this type. In 1929 Ask-Upmark demonstrated the relationship between unilateral renal disease and persistent hypertension. Experimental confirmation of this clinical observation was provided by the major contribution made by Goldblatt and his colleagues in 1937. They produced hypertension in animals by a partial constriction of the main renal arteries. In 1933 Longcope and Winkenwerder had demonstrated the relationship between hypertension and contracted kidneys caused by chronic bilateral pyelonephritis. This fact, plus Goldblatt's demonstration that hypertension could result from lesions on one side, led to a wave of enthusiasm for nephrectomy in patients with hypertension and unilateral chronic pyelonephritis. Successful results were reported by Butler (1937), Barker and Walters (1938), and others, and nephrectomy for other types of lesions affecting one kidney were also reported by Leadbetter and Burkland, and Boyd and Lewis.

By 1940 a cautious evaluation of clinical results, and an analysis by Crabtree and Chaset of 150 cases of severe unilateral renal damage, of which only 14 revealed hypertension, led to more careful selection of patients to be subjected to nephrectomy. The same year, Braasch and his colleagues published an extensive study of unilateral atrophic pyelonephritis and its relationship to hypertension.

There is no question that in carefully selected cases gratifying results have followed nephrectomy and will continue to do so, but indiscriminate removal of diseased kidneys for hypertension has been abandoned. It is evident that the Goldblatt mechanism may be the true cause of hypertension in some instances, and when this is

the case, dramatic results may follow nephrectomy. Diagnosis of such cases has been made much more precise by the use of aortography, with which the presence of unilateral arterial obstruction may be demonstrable. Certainly, the experimental demonstration of unilateral renal disease as a possible cause of hypertension constitutes an outstanding contribution of our generation.

Surgery of the Ureters

In 1905, ureteral surgery was still largely in the domain of academic interest. Although numerous articles had been published on the theory of such operations, in actual practice very few operations had been performed. With the developing diagnostic procedures and their continuous refinements, lesions hitherto unsuspected have been observed with increasing frequency. To enumerate a few, primary tumors of the ureter, congenital anomalies, such as ectopic ureters, reduplication, circumcaval ureter, congenital strictures, ureteral agenesis, ureteroceles, and neuromuscular dysfunction of the ureters are well recognized entities. With refinements in roentgenologic diagnosis and new diagnostic procedures which have resulted in more frequent diagnosis of these various ureteral lesions, surgical procedures have been devised to cope with them, so that at present, conservative operations previously thought impossible are routine measures in urologic surgery. Refinements in surgical technique, the availability of antibiotics and surgical accessories, and the newer methods of anesthesia have all contributed to this development.

Ureteral calculi. In 1904 Fowler was able to collect 24 cases of stone impacted in the lower end of the ureter in the male in which operations had been performed. After 1910, when Gibson published his description of an extraperitoneal approach by which the entire ureter could be exposed, ureteral surgery became more soundly established, and, of course, received great impetus from the use of radiopaque catheters and subsequent developments in roentgenologic diagnosis. Judd, in 1913, and Birnie, in 1914, described a midline approach for the lower end of the ureter. The extraperitoneal operation with approach to the upper ureter by a muscle-splitting incision described by Foley in 1935 was a noteworthy technical contribution which has been widely used and has influenced all ureteral surgery subsequently.

Young removed the first ureteral calculus from the lower end of the ureter through a cystoscope in 1902. The endoureteral method was advanced by the work of Lewis, and particularly by Crowell, who in 1921 reported on a large series of ureteral stones removed in this way. Councill (1926), Johnson (1935), and Jarman and Scott (1937) later made important contributions to the technique of transurethral operations for ureteral stone. Others who advanced this work by devising special instruments are mentioned in the section on urologic instruments.

Ureteral anomalies. Although ureteral anomalies had been described before 1905, these were then, generally speaking, in the category of pathologic curiosities, discovered at autopsy. As diagnostic procedures improved and these anomalies were recognized clinically with increasing frequency—during the past 20 years, particularly—they were well classified and numerous procedures were devised for their correction and treatment. This is by no means a limited field, for, according to Campbell (1954), anomalies of the urogenital tract exceed all others and account for 35 to 40 per cent of all maldevelopments. A large proportion of these urogenital abnormalities involve the kidneys and ureters. Campbell classifies ureteral anomalies as follows: anomalies of number include agenesis, duplication, triplication; anomalies of origin and termination include ectopia, ureterocele, blind ending, ureteropelvic anomalies, postcaval ureter, and ureteral herniation; and anomalies of form, caliber, and structure include aplasia, congenital stricture, congenital valves or folds, congenital dilatation without obstruction, congenital diverticula, torsion or spiral twists, kinks, and vascular blockage. These anomalies are important not only for their own sake but because they play a large role in genitourinary infections and other diseases, since the anomalous organ is more prone to disease than is the normal.

During the past 50 years, a relatively large literature on ureteral anomalies has accumulated, and only a few of the publications that have advanced our knowledge of these conditions can be cited here. Caulk first described megaloureter in 1918 and published additional work on this subject in 1932. Vermooten also discussed dilated ureters in children in 1939. A recent contribution on primary megaloureter was made by Campbell in 1952. In 1935 Higgins performed a retroperitoneal anastomosis of a dilated right ure-

ter into the normal left ureter, because of intractable, painful ureteral reflux. Important contributions on ureteral diverticula were made by Neff in 1921, Stevens in 1926, Rathburn in 1927, and Kretschmer in 1934. Congenital stricture of the ureter was discussed by Chwalla in 1927.

In 1942 Lowsley and Conroy discussed the diagnosis of aberrant ureters and their surgical treatment and stated that approximately 300 cases had been recorded in the literature. The cranial segment of the double kidney is usually destroyed, and they found that the aberrant ureter in the female opens usually in the urethra or vestibule, while in the male it opens most commonly in the prostatic urethra or seminal vesicles. They advocated heminephrectomy and ureterectomy as the procedure of choice. Campbell (1954) reported 342 instances (281 adults; 61 infants and children) of ureteral reduplication found at autopsy among 51,880 cases, an incidence of 1 to 161. The reduplication was complete in 101 cases, but it was bilaterally complete in only 4. Obstructions, congenital and otherwise, are not uncommon in reduplicated ureters, and were present in 14 of 61 cases in children, with stricture in 10 cases, ureteral valve in 3, and stone in 1 case. In a series of 4,774 urograms, Nordmark (1948) found 138 cases of double ureter (19 bilateral; 119 unilateral). Sixty of the unilateral cases (1.3 per cent) showed incomplete, and 59 showed complete, reduplication. At present no embryologic theory explains all cases of ureteral reduplication. Higgins, in 1954, reported a case in which ureteropelviostomy was performed for this condition, and intravenous urograms taken 8 years later showed excellent results.

During recent years there has been considerable interest in retrocaval ureters because modern roentgenographic methods make their recognition much more frequent than formerly. Randall and Campbell discussed 2 cases of retrocaval ureter in 1935 and pointed out that the diagnosis is suggested by mesial displacement of the ureter over the spine and an S or sickle-shaped ureterographic shadow at the point of obstruction, with dilatation above. In oblique films the ureter impinges against the lower lumbar spine. According to Campbell (1954), 38 cases have been reported, in which urographic diagnosis was made preoperatively in 5, and operation was carried out in 10.

Ureterovaginal fistula. With the increase in the number of complete hysterectomies being performed, ureterovaginal fistulas are more frequently observed than formerly. It is generally accepted that deligation or reimplantation of the ureter into the bladder are the procedures to be used.

Ureteroureterostomy. Since 1934, when Higgins performed the first successful transureteroureterostomy, use of this procedure has been reported in more than 15 cases by other urologic surgeons. In the past few years, this operation has been performed with increasing frequency, and various techniques of end-to-end anastomoses have been evolved. Although the immediate results are gratifying in the majority of instances, a stricture usually develops at the site of anastomosis as time elapses. Unquestionably, refinements in surgical technique will eventually lead to a procedure which will obviate this complication and lead to more satisfactory end results.

Ureteral tumors. In 1905, primary tumors of the ureter were unknown; in 1942, Scott reported 2 cases of primary tumor of the ureter and reviewed 180 collected cases.

Ureteronephrectomy with excision of a segment of the bladder about the ureteral orifice is accepted as the procedure of choice in the treatment of papillary tumors of the renal pelvis and is done through a retroperitoneal approach. At present, the majority of urologic surgeons favor radical extirpation and extensive resections for tumors of the ureter, that is, papillomas or carcinomas. However, in 1945, Vest advocated conservative therapy in carefully selected cases, including some benign papillomas. To evaluate the role of conservative surgery in the treatment of benign papillomas of the ureter will require a careful postoperative survey in a large series of cases over a period of years.

Plastic operations. It is here emphasized once again that the trend in urologic surgery, including surgery of the ureters, is toward conservatism and the conservation of the maximal amount of renal tissue compatible with eradication of obstruction or disease, in all types of cases except cancer. Many, if not most of the advances in surgical technique during the past 2 decades have been in the development of new plastic procedures, and modern surgical accessories and adjuvants make such operations possible in an ever-increasing number of cases. In this development of plastic urologic procedures, the work of Foley represents an outstanding contribution, particularly his Y-type of plastic operation for obstruc-

tion at the uteropelvic junction, which has been applied in a wide variety of lesions. In 1928 Keyes reported a successful plastic repair by intubation of the ureter. Intubated ureterotomy, more recently, has received extensive study and application by Davis and his associates (1948, 1951). Numerous procedures have been devised for ureteropyelostomy, but these are not used as frequently as they once were. One of the early operations of this type was that described by Schwyzer, in 1923.

Ureteral stricture. Ureteral stricture must be mentioned because it is a subject that has received much consideration and much space in the literature during the past 50 years, largely as the result of Hunner's idea, published in 1911, that inflammatory ureteral stricture was particularly common in women as the result of remote focal infection. This concept was widely accepted, but numerous investigators, including Shreiber (1927), Nixon (1929), and Frater and Braasch (1929), challenged the existence of such a lesion on the basis of experimental and pathologic evidence, obtained at autopsy. Opinion is still divided but it seems evident that this lesion is of diminishing importance, and with antibiotic therapy is likely to remain so. In the literature, it seems to have faded away as newer interpretations have replaced the concept of focal infection.

Surgery of the Bladder

Tumors of the bladder. The diagnosis and treatment of tumors and other lesions of the bladder became an important field after the invention of the cystoscope. As improved operating instruments were developed, interest in treatment of the bladder became very keen. Fifty years ago, this was practically virgin territory, however. That this was true, particularly with reference to tumors, is shown by the first urologic article in the first volume of *Surgery, Gynecology and Obstetrics*, which was contributed by my late chief, William E. Lower. Its title was *The Diagnosis and Treatment of Some Surgical Diseases of the Urinary Bladder*, and it included simple inflammations, simple ulcers, tubercular inflammations and ulcers, ureteral calculi in the vesical portion of the ureter, and benign and malignant tumors. Lower commented as follows on malignant tumors: "Malignant growths involving the bladder are not promising cases for surgical intervention, and my personal experience in operating in these cases is limited to one case of resection of part of the bladder-wall. This was done entirely too recently to state what the outcome will be. So far the case is progressing favorably."

Rafin's statistics (1905–1906) for simple excision of bladder tumors without resection of the whole thickness of the bladder wall in 205 collected cases showed 8 per cent operative mortality for benign tumors and 14 per cent for malignant tumors. In 96 operations in which the bladder wall was resected, the operative mortality was 21 per cent. Watson, in 1905, in reviewing the results in 653 tumors of the bladder surgically treated, noted that 28.6 per cent of the benign tumors recurred after operation and that 46 per cent of the malignant tumors recurred; these figures represented the percentage of surgical failures.

At the beginning of this century, the widespread interest in the then relatively new monopolar and bipolar high frequency currents (which had been introduced during the 1890's by Oudin and D'Arsonval) made it inevitable that this modality would be combined with the operating cystoscope. Beer is credited with the first operation for removal of a bladder tumor with the monopolar current, in 1910. Almost at the same time, Keyes used the bipolar current for this purpose. Transurethral electrosurgical treatment was widely adopted and proved satisfactory for benign tumors, but before long it began to be evident that some apparently benign tumors eventually showed malignant degeneration at the base and were not cured by this means. For these and the obviously malignant papillomas of the bladder, new surgical treatments had to be devised, and many of these were combined with irradiation because therapeutic radiology was then a rapidly developing special field. To select proper therapy for bladder tumors, more accurate diagnosis based on improved pathologic classification was necessary. The pathologic differentiation and classification of bladder tumors were advanced by the work of Geraghty (1915) and Broders (1922).

Carcinoma of the bladder was first treated with roentgen rays in 1906, by Gray, of Richmond. The radiation beam was directed through a special cone inserted into a suprapubic incision. Five months afterward, he reported that there was no evidence of recurrence. According to Corbus, Cleaves, of Philadelphia, was the first to use radium in the bladder, in 1903. However, most attempts at radiation therapy prior to 1905 were

merely trial and error experiments, but from these, data were collected that led to the formulation of Bergonie and Tribondeau's law, in that year, which stated that immature cells and cells in an active state of division are more sensitive to irradiation than those with fixed adult morphologic and physiologic characteristics. After recognition of this fact, the development of radiation therapy was primarily associated with the treatment of malignant disease.

Pasteau and DeGrais reported the first use of radium introduced through a cystoscope for treatment of bladder cancer, in 1913. A few years later (1917), Young introduced a special cystoscopic radium applicator, and subsequent popularization of combined fulguration and radium therapy for bladder tumors was stimulated in large part by the work of the Baltimore group.

During this period before 1920, extensive surgical procedures were also recommended by some urologists for the treatment of bladder tumors, but the mortality following these procedures continued to be high and recurrences were frequent. Later it became evident that it was necessary to remove a portion of the bladder wall around the tumor and also, in some cases, the peritoneum. Young, in 1930, described a transvesical technique for removing malignant tumors of the posterior wall along with the entire bladder wall and the peritoneum covering it.

Carcinoma of the bladder still constitutes a formidable challenge to the urologist, and its treatment remains a controversial issue. The type of therapy selected and the prognosis depend, in the individual case, on the presence or absence of infiltration, the situation of the tumor and its size, and the type and degree of malignancy. It is generally agreed that benign or malignant papillomas of noninfiltrative type respond to conservative treatment by fulguration or transurethral resection.

Disagreement exists primarily with regard to the treatment of infiltrative tumors. Numerous procedures, including external irradiation, implantation of radium seeds, partial cystectomy, and radical cystectomy with and without pelvic lymphadenectomy, still have their advocates. The fact remains, however, that 5 year cures with any of them remain exceedingly few, and adequate statistical evaluation of the published results is practically impossible. Jewett (1952) has stressed that the incidence of metastases and extravesical extension is directly proportional to the depth to which the tumor has penetrated the wall of the bladder.

Throughout the years there have always been some urologists who have advocated total cystectomy for infiltrating tumors; among those whose work in this field became well known were Beer, Lower, and Charles Mayo. Following Coffey's experimental work, which demonstrated a method whereby the ureters could be transplanted into the rectosigmoid, cystectomy was more frequently performed, and during recent years, since formidable and extensive procedures have become less hazardous from the standpoint of immediate risk, cystectomy with ureterosigmoidostomy has gained new adherents. Nevertheless, the morbidity associated with transplantation of the ureters into the rectosigmoid still remains high and is a formidable barrier to general acceptance and widespread use of this procedure. To arrive at a satisfactory evaluation of the role of cystectomy in the treatment of carcinoma of the bladder, it is necessary that larger series of cases be followed up over longer periods and that they be critically analyzed not only from the viewpoint of "curability" of the lesion but also with consideration of the morbidity from pyelonephritis, hyperchloremic acidosis, and death from urostasis and renal failure.

Although roentgen therapy has advanced steadily throughout the past 50 years, with the development of precise dosage techniques and increasingly powerful generators of radiation, the results of external irradiation of invasive bladder tumors have remained quite consistently disappointing. Each improvement in radiation therapy has been greeted with the hope that treatment of these lesions would be more successful, but when sufficient time had elapsed for evaluation of the results, they still remained poor. Such hopes have once more been renewed by the development of the betatron and extremely high-voltage generators and also of the cobalt bomb, and there is a current wave of interest in the possibilities of using these modalities in the treatment of patients with carcinoma of the bladder. Only time and experience will tell whether these newer methods will succeed in these difficult cases, in which previous methods have failed.

Ureterosigmoidostomy. Sporadic attempts at ureterointestinal transplantation had been made from time to time during the latter part of the nineteenth century, without success. During the

decade prior to 1905, numerous investigators, notably Martin, Peters, and Fowler, had devoted concentrated effort to the problem, but, with rare exceptions, their experimental operations on animals were unsuccessful. In 1910, Coffey worked out his technique of submucous implantation of the ureters in animals, and Charles Mayo was the first to apply the Coffey principle in clinical work. Coffey himself made his first clinical report in 1913. In subsequent years, Coffey, Charles Mayo, and Lower were probably the principal protagonists of ureteral transplantation into the intestines. They and others, including Cabot, Hinman, Higgins, Poth and Foley, devised numerous modifications of the original Coffey technique. The trough principle, described by Coffey in his report of 1933, served as an immediate stimulus for much of this work. At that time he reported 11 cases of cystectomy and ureterointestinal anastomosis, with only 3 deaths. Despite all the modifications, the ideal technique is still to be evolved, for results with present procedures are still far from uniformly satisfactory. It is to be hoped, and even anticipated, that further investigation will lead to the development of a procedure which will eliminate ureteral obstruction, stasis, and the eventually fatal outcome from pyelonephritis and renal failure.

Recent and continuing studies on the chemical imbalance which develops subsequent to ureterosigmoidostomy represent a major contribution which may help eventually in solving this surgical problem. In 1940, Jewett suggested that absorption of urinary urea and chlorides from the colon is responsible for the acidosis and uremia exhibited by some patients who have been subjected to ureteral transplantation. His views were later confirmed and expanded by Ferris and Odel (1947) and by Boyce and Vest (1950). In the treatment of this hyperchloremic acidosis, the former authors suggest a low salt diet with a chloride free salt substitute, and frequent emptying of the rectum. Boyce and Vest have advocated a relatively low protein diet with an alkaline ash, forcing of fluids between meals, and sodium citrate solution three to four times daily, in addition. These methods are quite successful in coping with this complication.

Plastic reconstruction of the bladder. Since 1950, several suggestions have appeared in the literature, recommending the construction of a substitute bladder. Gilchrist, Merricks, Hamlin, and Rieger described a procedure in which a substitute bladder is made from the cecum and ascending colon. The intestinal continuity is established by ileocolostomy, and the ureters are transplanted into the cecum. Bricker presented another technique in which an isolated segment of the terminal ileum was utilized as a substitute bladder. Reports on the relatively few cases treated by these methods seem highly gratifying, and further experience with these procedures will determine whether they will occupy a permanent place in standard urologic surgery.

Neurogenic lesions of the bladder. This subject, which can be merely touched upon here in a few sentences, would require many pages for adequate discussion. This field is one that is at present in a very active stage of development. Much investigative work is being done, and new concepts and new treatments are constantly evolving. As is inevitable in such a situation, there are numerous divergent opinions regarding classification of cases, diagnostic methods, and treatment procedures. From the intensive study of spinal cord injuries suffered by military personnel, many new data have accumulated during the past decade, and from this wide experience has come increased stimulation for the study of the serious problems involved in these cases.

Among those who made outstanding earlier contributions were Rose, who presented his cystometer for measuring pressure-volume relationships in the bladder, in 1927, and Munro, whose tidal drainage apparatus was described in 1934. In 1936, Munro developed a cystometer for measurement of bladder activity, with which adjustment of the tidal drainage apparatus could be correlated.

Munro is still actively interested in investigations concerned with diagnosis and treatment of neurogenic bladder lesions. Others who have made notable contributions in this field include McLellan, Prather, Emmett, Nesbit, and Bors. In many recent studies conservative treatment, including improved methods of bladder drainage, better control of infection, and use of parasympathicolytic drugs, such as banthine, has been evaluated; and other investigations have set forth the results of various surgical procedures, such as transurethral resection, pudendal nerve block and section, transsacral block, spinal anesthesia, subarachnoid injection of alcohol, local anesthesia of the vesical neck, and anterior rhizotomy. From all this work, much

more precise classification and selection of cases are emerging to aid in continued improvement of the therapeutic results.

Surgery of the Prostate Gland

In 1905, as in 1955, operations on the prostate gland occupied a central and prominent place in urologic surgery, and then, as now, there was considerable difference of opinion as to the preferred type of procedure. This is reflected in the lively discussions reported in the transactions of the Mississippi Valley Medical Association and of the Chicago Medical Society recorded in Volume I of SURGERY, GYNECOLOGY AND OBSTETRICS. At the former meeting, held in Indianapolis in October, 1905,—incidentally, with our own Bransford Lewis presiding—Haines, of Cincinnati, presented a paper on the results of perineal prostatectomy in 16 cases, and estimated that "one could confidently hope for complete cure in 30 per cent of the cases submitted to prostatectomy." In the ensuing discussion, in which Scherck, Lydston, Eastman, Whitacre, Carothers, E. B. Smith, and Ferguson participated, preference for the suprapubic operation were expressed by some, and various technical points were discussed. An even longer report and more detailed remarks of the various discussants at a meeting of the Chicago Medical Society was published on this subject on November 14, 1905. At that time William T. Belfield presented a paper: *Operative Treatment of Prostatic Hypertrophy*, and concluded that the perineal operation was preferred by most surgeons because of its lower mortality, but that suprapubic prostatectomy gave better results. He quoted Proust and Albarran as saying, ". . . improvements in technique, by materially reducing its mortality figures, will make suprapubic prostatectomy the preferred and standard operation." He then described an improved technique of suprapubic operation and also a two stage procedure, noting that some of the danger of the latter could be obviated by the use of nitrous oxide anesthesia. Opinions of the discussants, Ferguson, Van Hook, Andrews, Kriessl, Halstead, Wells, Kolischer, and Fuller, were far from unanimous in regard to the merits and demerits of the perineal and suprapubic techniques. Another excellent paper on prostatic surgery in the first volume of SURGERY, GYNECOLOGY AND OBSTETRICS was that by Willy Meyer: *Choice of Method in Operating Upon the Hypertrophied Prostate*, which was printed in abstract form. His concluding remarks are worth quoting, for they probably represent the best surgical opinion of his day, and also of our own time (except that we have some additional procedures to choose from). He said: "Surgeons should familiarize themselves with perineal and suprapubic prostatectomy, as well as with galvanocaustic prostatotomy (Bottini's operation), in order to be able to do justice to the prostatics entrusting themselves to their care, for no one method of operation can be employed in all cases of prostatic enlargement to the best advantage of the patient. In other words, we must select the operation that suits the case."

The foregoing shows that prostatic surgery was already well advanced 50 years ago, and that it was occupying the effort, time, and thought of some of the best surgeons of the time. Despite the innumerable improvements in technique and in the management of patients with prostatic disease, and the vast literature that has accumulated —a veritable library in itself—in the intervening years, the basic problems throughout the years have remained the same, and efforts are still being made to devise procedures and methods that will reduce the morbidity and mortality. In this article, it is impossible even to attempt to review these developments, or to mention individually the men who have made significant contributions in this field. Probably the first name that most urologists would think of in connection with the development of prostatic surgery during the past 50 years would be that of Hugh Young, who perfected the "punch" operation and also contributed so much to improvement of the perineal operation and of radical procedures for prostatic carcinoma. Immediately afterward, one would think of Lowsley, Lower, Squier, Judd, Mayo, and a host of others. The constant study of these men, and innumerable others like them, and the improvements in anesthesia, control of infection, and supportive measures have given to urologists of the present generation many advantages in prostatic surgery which the former did not enjoy and which have contributed enormously to the safety and satisfactory results of treatment.

Perineal prostatectomy. Although numerous procedures for perineal prostatectomy had been devised and widely used before and after 1900, including those of Goodfellow, Syms, Johnson, Guiteras, Murphy, Gouley, Lydston, and Alexander, the technique described by Young in

1903, with its subsequent modifications is the one that has become more or less standard during the past 50 years. The outstanding feature of this was (to use Young's own description) the "double-bladed tractor to draw down and facilitate the enucleation of the prostate which had been exposed behind the triangular ligament and external sphincter, both of which were carefully preserved. In order to prevent injury to the verumontanum and ejaculatory ducts, Young employed a bilateral capsular incision through which the lateral lobes were first enucleated and then the middle lobe. The ability to see what one was doing, to arrest hemorrhage, to pack the wound to stop oozing, and the obtaining of excellent two-way tube drainage, as well as the great reduction in mortality, at once recommended the operation." Young himself later modified the operation several times, and other modifications were presented by Hinman, Cecil, Davis, Belt, Wildbolz, Geraghty, and many others. Throughout the early decades of this century, the perineal operation was still preferred by most surgeons, because of its lower mortality rate.

Suprapubic prostatectomy. Belfield, McGill, Fuller, and Guiteras were among the early American pioneers who contributed to the development of this operation prior to 1900. Freyer described the procedure in 1901, and throughout Europe his name was usually connected with this technique. Interest in this operation was keen, but its application was considerably hampered in early years because of its higher mortality, although many conceded that it yielded results superior to those obtained with the perineal operation. A major advance in the suprapubic operation was made by Squier, in 1911, when he introduced the intraurethral method of enucleation of the gland. Innumerable modifications of the suprapubic prostatectomy were proposed subsequently, all attempting to add to the safety, principally by avoidance of infections and hemorrhages. Among those who made outstanding contributions were Lilienthal and Pilcher (1914), Judd (1916), Hagner (1914) and Pilcher (1917),—the last two recommending bags to aid in the control of hemorrhage—and Lower (1914). Lilienthal, Judd, Keyes, and Lower were among the foremost protagonists of the two stage suprapubic prostactectomy.

Transurethral resection. As already noted, Bottini's electrocautery procedure was among the operations used for prostatic hypertrophy in 1905, and Chetwood's modification improved the method, although it was never widely adopted in this country. From a practical standpoint, transurethral surgery of the prostate may be said to date from 1909, when Young developed his "urethroscopic prostatic excisor," or punch, to remove obstructive masses of prostatic tissue at the vesical orifice. Young improved his instrument in 1912, and other modifications were proposed in rapid succession by Goldschmidt, Franck, Wossidlo, Stevens, Bugbee, Luys, Braasch, and Caulk, and many others. Caulk became one of the principal advocates of transurethral procedures, and extended them to all types of cases, even those with massive hypertrophy. The instrument devised by Braasch in 1918 was revised later by Bumpus and then by Thompson. Among those who devised special modifications in technique or instruments for transurethral resection during the 1920's were Geraghty, Tolson, Kenneth-Walker, Stern, Foley, Collings, Rose, McCarthy, and Kirwin. Some of these modifications are discussed more fully in the section on urologic instruments.

Retropubic prostatectomy. Although this is not a new procedure, the current interest in this technique has been stimulated by the work of Millin, published in 1945, and his subsequent campaign for its wider adoption. In 1954, he reported that he and his associates had performed more than 2,000 operations with this approach, and that during the past 5 years less than 20 per cent of his cases had been dealt with endoscopically. In all of the others the retropubic operation had been used. In the majority of cases, Millin prefers to enucleate the adenoma by the extravesical route, irrespective of the presence of bladder stoma, and he urges immediate closure of the bladder following transvesical prostatectomies (since some surgeons prefer to use them), as a means of preventing postoperative hemorrhage.

Not all surgeons who have used the retropubic technique are as enthusiastic as Millin, and some instances of osteitis pubis have been reported as complications. Whether it will become more popular or replace the suprapubic procedure (as Millin believes will happen) will be decided by longer experience and comparative statistical studies.

Choice of technique for prostatic surgery. It is usually agreed that of the four generally accepted

procedures used in the treatment of prostatic disease the operative technique to be utilized will be influenced by the surgeon's training, his experience, and the results achieved by himself and others with the various types of operations. Some urologic surgeons believe transurethral resection is applicable in all cases, but the majority use this method for removal of medium bars, the treatment of contracted vesical necks, and resection of smaller glands. Perhaps the majority still prefer the suprapubic prostatectomy, usually a one stage procedure. While perineal prostatectomy is still a sound procedure (and 50 years ago was three times as popular as suprapubic prostatectomy), it may produce potentially serious complications, and is now performed much less frequently than suprapubic prostatectomy. As already noted, the ultimate role of retropubic prostatectomy is yet to be evaluated.

The variety of procedures available for prostatic surgery makes it obvious that urologists in training should become familiar with all four techniques. As Willy Meyer advised 50 years ago, patients should be individualized, and the procedure chosen should be the one that the surgeon believes will give best results in his hands and will be attended by the least morbidity and the least danger of serious or fatal complications.

Studies on prostatic physiology and pathology. Although the ingenuity and industry displayed in devising new instruments and surgical methods for operations on the prostate, as well as their endless modifications, are almost overwhelming, and account for much of the progress that has been made in the treatment of prostatic disease, concomitant studies on prostatic function and degenerative changes have also constituted a major contribution of the last half century. It is in this field, also, that the greatest future advances will probably occur.

Despite the vast literature that has accumulated and the multiple theories that have been advanced to explain so-called prostatic hypertrophy, the problem is by no means solved. Nevertheless, new laboratory and clinical data dealing with biochemical, nutritional, and hormonal factors are being advanced constantly, and it appears likely that in the not too distant future the various pieces of this puzzle, some of them apparently contradictory, will be assembled and integrated into a satisfactory explanation of this condition that afflicts such a high proportion of elderly men.

In the space of this article, it would be impossible to set forth the various theories or the names of the men who have made prominent contributions to them. For an excellent recent summary of the development of knowledge on pathologic anatomy and the history of etiologic theories and studies on endocrine relationships, the review by Thomson and Ash (1954) is recommended.

Accessory and adjuvant treatment in prostatic surgery. Much, perhaps the major part, of the improvement in the results of prostatic surgery during the past 50 years is attributable to modern ideas of preoperative and postoperative care, satisfactory methods for decompression of the bladder, spinal anesthesia (for which Chute, Lowsley, Young, and Hunt deserve much credit), the administration of parenteral fluids, and, above all, the control of infection with antibiotics, as well as to other supportive measures. Mortality statistics furnish a good index of the progress that has been made. According to Hunt (1931), Whiteside reported an average mortality following prostatectomy of 20 per cent, prior to 1905. In 1921, Deaver and Leon estimated that the average mortality from prostatectomy performed by the occasional or inexperienced operator was between 20 and 30 per cent. Hunt, himself, estimated the average mortality from either perineal or suprapubic prostatectomy in the hands of most surgeons in 1930, as between 5 and 10 per cent. According to Colston, the present mortality following perineal prostatectomy is practically nil, and in a series of operations performed from 1949 to 1951, O'Conor reported a death rate of approximately 0.55 per cent after transurethral resection and of 1.05 per cent after suprapubic prostatectomy. He commented (1954) that recent figures suggest that the mortality in well recognized clinics, where younger surgeons are being trained, varies from 2 to 8 per cent. Even the latter figure shows great improvement over the results of 25 years ago.

Once more, it is well for us to remember that those of us performing prostatectomies today are not more intelligent nor more skillful surgeons than were our predecessors of 50 years ago. Our results are better because of what they learned by experimentation and long experience and then taught us, and because enterprising investigators in fields outside of urology have presented us with improved anesthetics and effective agents against bacterial infection.

Carcinoma of the prostate. Carcinoma of the prostate had been recognized as a clinical entity throughout most of the nineteenth century, and its propensity for metastases to the lymph nodes, viscera, and bones was well known. Nevertheless, in 1905 it was just beginning to be appreciated that prostatic cancer was of relatively frequent occurrence. This fact had been brought out by Albarran and Halle in 1898, who reported 14 instances in a series of 100 cases of supposedly benign prostatic hypertrophy, and stimulated much interest in the histology, diagnosis, treatment, and pathologic anatomy of both benign and malignant prostatic lesions. Young reported in 1905 that approximately 20 per cent of the patients who sought treatment for prostatic obstruction had carcinoma, and the following year he and Geraghty reported a pathologic study. Other important pathologic studies were contributed by Pasteau, Wilson and McGrath, Sutherland, Shaw, Bumpus, and many others; all corroborated the high incidence of prostatic carcinoma and its widespread metastases, particularly to the bones. In 1935, Rich reported the incidence of prostatic cancer in routine autopsy as 14 per cent. Moore, the same year, reported 18 per cent, and in 1941, Baron and Angrist found 15.8 per cent. Furthermore, the last authors, in studying serial sections of 50 consecutive cases, discovered the startling incidence of 46 per cent. In all these autopsy studies, the percentage incidence rose with age.

Young devised his radical operation for prostatic carcinoma in 1904, in which the entire prostate, with a cuff of the bladder and both seminal vesicles and ampullae was removed, which removal was followed by anastomosis between the bladder and membranous urethra. Many modifications and other extensive radical techniques were later developed, including those of Jewett, Vest, Lewis, and G. G. Smith. During the years from 1905 to 1955, an enormous amount of experimentation and clinical investigation of radium and roentgen-ray techniques, and of combined surgical and irradiation techniques has been reported.

Although scores of illustrious men have made important contributions to our knowledge of prostatic carcinoma, at present the name that comes first to mind and is most prominently associated with this condition is that of Huggins, whose outstanding work on the endocrine factors and their applications to treatment, first presented in 1939, has offered a new approach to these cases and has provided fresh hope that ultimately this type of malignancy may be more satisfactorily controlled. Indeed substantial steps in this direction have already been taken, and the results achieved during the past decade are encouraging. The value of bilateral orchiectomy or estrogen therapy in the management of cases of inoperable or disseminated prostatic carcinoma has received general acceptance. More recently, Huggins and his associates have been working on the problem from the standpoint of the adrenal and pituitary glands. Huggins and Bergenstal proposed adrenalectomy for inoperable prostatic carcinoma in 1951, but so far, according to Scott, this procedure has not been so satisfactory as it is in breast cancer. More time will be necessary to determine whether this operation has practical clinical value. The same is true of hypophysectomy.

In view of our present knowledge, radical perineal prostatectomy remains the procedure of choice in an individual with a carcinomatous nodule in the prostate, when the roentgenogram fails to reveal evidence of metastasis and the serum acid phosphatase is normal. When the lesion is inoperable, the two objectives of treatment are relief of pain and relief of obstruction. Irradiation of the bone lesions is still an important modality, and use of gonadal hormones is at least temporarily beneficial in many cases. Even more fruitful results should accrue from current experimental and clinical studies in this field, including the use of radioactive isotopes.

Anomalies of the Lower Genitourinary Tract

Within the limitations of this review, it is possible merely to mention the congenital abnormalities involving the bladder, urethra, and sex organs. This constitutes a very large special field of interest to urologists, and space does not permit even a complete listing of all the different types of malformations. Suffice it to say that these unfortunate defects have received much attention, and many ingenious plastic procedures have been devised in attempts at surgical reconstruction and correction. This phase of urology is not new, since Thiersch's first operation for epispadias was performed in 1869, and the basic principles now being used in performing urethroplasties were known before 1890.

Numerically, cryptorchism, or failure of the testicle to reach its normal destination in the

scrotum, is the most common anomaly of the spermatic tract. Surgical and medical treatment methods devised during the past 50 years are now successful in salvaging reproductive potency in a large proportion of these cases, and investigative work in this area is currently in the foreground. From the standpoint of surgical treatment, epispadias, extrophy of the bladder, and hypospadias represent serious clinical problems, to which better solutions have been and are still constantly being sought. Hypospadias always includes some elements of pseudohermaphroditism, and the tragic problems of intersexuality are receiving more study constantly. The enormous interest and striking developments in all phases of endocrine physiology and interrelationships, and embryologic and genetic studies during the past 2 decades have offered new stimuli and new approaches in the study of these genital anomalies. Although the results of surgery in many of these cases still leave much to be desired, the past 50 years have seen many improvements in technique and a considerable increase in the number of successful results, particularly since the antibiotics have provided a potent weapon against infection, which was such a formidable obstacle in earlier work.

Undescended testicles (*cryptorchism*). As already noted, failure of the testes to descend into the scrotum normally is a common anomaly. In a series of 10,852 boys examined at autopsy, Campbell found 313 instances of cryptorchism, or 1 in 34. The cause is sometimes obstructive or mechanical, and one of the contributions of our own generation has been the demonstration that endocrine factors also play an important role in many cases. This has been amply proved both by experimental studies and clinical observations. Among those who have made important contributions in elucidating the endocrine factors in cryptorchism are Engle (1932), Womack and Koch (1932), Denis Browne (1938), and Deming (1937). Moore's work, published in 1930, on thermal factors and their effect on spermatogenesis was also an outstanding contribution to this subject.

It has been estimated that 90 per cent of males with bilaterally undescended testicles are sterile. This underlines the clinical importance of both medical and surgical treatment. During recent years, there has been an increasing trend toward earlier operations, in the attempt to prevent later sterility. The general consensus now is that an adequate trial of hormonal therapy should be made early; if this fails to produce results, operation should be performed, preferably when the boy is 3 or 4 years of age. Some surgeons still prefer to postpone the procedure until later, but published results seem to indicate that early intervention is most successful. Operations for undescended testes are very numerous. In each case the procedure must be individualized according to the anatomic features encountered.

Typical of the current interest in this problem is the fact that several medical institutions have undertaken long term studies to determine the fertility of individuals subjected to operations for undescended testes. For example, The Department of Anatomy of the University of Iowa is collecting specimens of testicular tissue obtained at the time of operation for cryptorchism, and is requesting each surgeon who contributes such a specimen to send another (to Warren Nelson) from a biopsy taken on the same patient at the age of puberty, when the testes are situated in the scrotum. It is hoped that such comparative studies on the same patient before and after descent of the testicles, and comparisons with pathologic material from patients whose cryptorchism was not surgically corrected, may yield much valuable information pertinent to sterility and fertility in the male. Similar long range investigations have been set up in other places.

Epispadias and extrophy of the bladder. In the surgical treatment of epispadias and extrophy of the bladder, Young, Lower, Mayo, and numerous others made important technical contributions during the past 50 years. Mayo, using the technique of ureteral transplantation that Coffey had worked out experimentally, first performed ureterosigmoidostomy in a patient with extrophy of the bladder in 1910. This is the generally accepted procedure today; the principal difference of opinion in regard to this concerns the time when the operation should be performed. Higgins and Campbell are representative of those who believe that the ureters should be transplanted during the first year of life, while Counseller and some others favor waiting until the fourth or fifth year.

Hypospadias. The operation described by Denis Browne in 1949 for urethroplasty in hypospadias is currently being widely used with gratifying results. This operation utilizes a principle described by Duplay in 1880 and again in 1886,

that is, that a strip of skin left attached along the ventral surface of the penis, if covered with broad-bearing flaps, would develop into a urethral tube. This idea was long overlooked and neglected, while much less satisfactory operations, such as those devised by Bucknall in 1907, and by Ombredanne in 1911, were adopted more generally and later subjected to modifications by others. The other operation for correction of hypospadias in current use is that described by Cecil in 1936, and some surgeons still prefer it to the Denis Browne operation. Both produce satisfactory results which, as Cecil says, "have taken the operation of hypospadias out of the realm of uncertain outcome." The improvement in the surgical treatment of this anomaly certainly represents a significant achievement of the present decade.

A difficult diagnostic problem arises in some cases of hypospadias of the perineal and pseudovaginal type, in determining the true sex of the patient without surgical exploration. Estimation of the 17-ketosteroids and estrogen may be suggestive, but these tests are likely to be more reliable in older than in very young patients. Two new approaches to this diagnostic problem have recently been reported.

Kunstadter, Guterman, and Tulky, in 1952, described a roentgenographic procedure utilizing transabdominal pneumoperitoneum for the diagnosis of pelvic anomalies and other pathologic conditions, which may be adequate to establish the diagnosis in sex endocrine disturbances.

Another extremely interesting contribution which should be applicable to the determination of the dominant sex in pseudohermaphroditism is the study of skin biopsies, reported by Moore, Graham, and Barr in SURGERY, GYNECOLOGY AND OBSTETRICS in June, 1953. A study of the skin specimens from 50 females and 50 males of normal sexual development demonstrated a difference in nuclear structure, according to sex, in the cells of the malpighian layer of the epidermis. Nuclei of female specimens contain a mass of sex chromatin which is seldom seen in the nuclei of male specimens. The sex chromatin is believed to be derived from heterochromatic parts of the sex chromosomes; the X-X chromosomes of the female produce a chromatin mass sufficiently large to be identified, while the X-Y chromosomes of the male fail to produce a chromatin mass of sufficient size to be distinguished from the general particulate chromatin. This method of determining the chromosomal sex of the individual was applied to 2 cases of hermaphroditism. One individual proved to be a chromosomo-female and the other a chromosomo-male. Extension of this study to other cases of intersexuality was urged by the authors in the hope of clarifying the complex problems involved in these cases. The potential importance of this skin biopsy technique lies in the possibility that it may prove to be a simple method of diagnosing the dominant sex in infancy in doubtful cases.

Tumors of the testes. The subject of testicular tumors represents another large area of urologic interest and endeavor, which cannot be discussed adequately here. To realize the progress that has been made, one has only to contrast the situation with regard to therapy of these lesions in 1905 with that today. Fifty years ago, most patients with a testicular malignant tumor were doomed, without hope, to early and certain death, while now their chances are comparable to those of patients with other types of cancer. The therapeutic outlook is far from hopeless, and is constantly improving. Much of the progress in treatment has been directly attributable to more precise classification of the pathologic lesions and to improved methods of irradiation therapy. Among those who made important contributions to the classification of testicular tumors were Ewing (1911), Ferguson (1933), and Hinman (1933). The principal types are teratoma, trophocarcinoma and seminoma. Seminoma comprises approximately 40 to 45 per cent of all testicular tumors, grows slowly, and is markedly radiosensitive. Nonseminomatous tumors, excepting pure teratomas and a few rare types, are highly malignant, usually radioresistant, and have prognoses of varying gravity. These differences in radiosensitivity, which have been constantly studied and further elucidated, have shaped the trends in modern therapy. A prominent pioneer in the radiation treatment of tumors of the testes was Archie Dean. By 1935 he, and later Randall and Bothe (1937), had decided that all testicular tumors should be subjected to preliminary deep roentgen therapy.

Combined surgical and radiation treatment is generally agreed upon by both surgeons and radiologists, but some difference of opinion still exists as to whether the lymphatic chain should be eradicated surgically or sterilized by irradiation. Simple orchiectomy was long ago proved to be ineffective in all types of testicular tumors,

and Chevassu, in 1910, devised an extensive procedure in which the entire lymphatic system from the testicle to the preaortic nodes was removed. This type of radical extirpation was later modified by Hinman and others. Although some surgeons still adhere to the advisability of such operations, especially in nonseminomatous tumors, the trend recently seems to be toward more reliance on irradiation to eradicate lymph node metastases or to prevent its occurrence. It is more or less generally accepted that irradiation alone is sufficient to control early metastases in the lymphatics from a seminoma, but further experience will be required to justify conclusions as to whether embryonal carcinomas and teratocarcinomas should be treated by irradiation followed by surgical extirpation of the pelvic and abdominal lymphatics, or whether the lymphatics should be removed first and irradiation used postoperatively. The rapid advances that are now occurring in the field of radiation therapy in work with the new higher voltage generators, the cobalt bomb, isotopes, and other radiation techniques may improve the picture in relation to irradiation treatment of testicular tumors, and help to solve the still formidable clinical problems in these cases.

Adrenal Surgery

Advances in surgery of the adrenal glands, which have interested urologists increasingly during the past few years, represent an epochal achievement. Currently, these glands — their physiology, hormones, biochemistry, and pathology—offer one of the most active fields for experimental and clinical research not only with regard to urology but to all other departments of medicine and surgery. That this development is recent is attested to by the fact that in the *History of Urology*, published in 1933, there was no consideration of the adrenal glands, and, although the present trend had its beginnings in the 1930's, Hugh Young's review devoted only a brief paragraph to the earliest adrenal operations. He noted that the first successful operation on an adrenal tumor was that of Gordon Holmes, in 1924. Among the surgeons who performed adrenalectomy after 1930 were Crile (1932), Goldzieher and Koster (1935), Broster and Vines (1933), Walters (1935), Cahill (1936), and Young (1936).

Since the function of the adrenal cortex is indispensable to life, operations on the adrenal glands were not feasible or possible until potent extracts were available for use as substitution therapy. Much had been learned about adrenal insufficiency through clinical studies on Addison's disease, to which Rowntree and others made valuable contributions during the 1920's and 1930's. The first active extract of the adrenal cortex was prepared by Swingle and Pfiffner in 1931, and Rowntree was the first to use it in the treatment of patients with Addison's disease. Although its effect appeared promising, the extract was not potent enough to produce the desired clinical results. The work of biochemists in many places in preparing more potent extracts and in isolating numerous components of the adrenal cortical complex culminated in the development of cortisone and ACTH, which have so dominated medical experimentation during the past decade and have led to so many revisions in previous concepts of various diseases.

As knowledge has accumulated concerning the functions and dysfunctions of the adrenal glands, steady progress has been made in the diagnosis of adrenal disease and in its treatment. As more and more has been learned about the physiologic effects of the cortical hormones, a clearer conception has been gained of their complexity. Much research still remains to be done in the future to elucidate completely the function of these tiny glands which are indispensable to health and life. Selye's studies have shown that the adrenal cortex plays an important part in the response of the body to stress of all kinds.

According to Harrison, approximately 28 different steroid compounds have been isolated from extracts of the adrenal cortex. Investigations are continuing in medical institutions throughout the world on problems dealing with adrenal physiology, adrenal hormones already known, and with the isolation and detection of new hormones and their synthesis. Although it is impossible to predict where the next discovery relating to the adrenal glands may lead, present studies apparently are aiming toward clearer concepts of the role of the adrenocortical hormones in relation to electrolyte balance, metabolism of the carbohydrates and fats, and to certain sexual abnormalities, such as virilism and pseudohermaphroditism. Already the laboratory procedures used to test adrenal function are very numerous, and their routine clinical use is increasing. Among the clinical tests commonly used are the Thorn or ACTH test, the water test, the salt deprivation

test, prolonged fasting, and insulin tolerance, besides determination of the urinary 17-ketosteroids, and, more recently, their differentiation by electrophoretic analysis. It is to be expected that the armamentarium of diagnostic tests of adrenal function will be expanded, and that many refinements in technique will be reported in the next few years.

The recognition of the adrenogenital syndrome and the institution of hormonal therapy is receiving more attention from urologists. The diagnosis of female pseudohermaphroditism, macrogenitosomia praecox, adrenal virilism, and feminization in the male is now rendered possible by physical findings, laboratory data, and, in some cases, therapeutic tests. In some cases, however, surgical intervention is essential to establish the correct diagnosis.

The clinical picture of Cushing's disease or syndrome, first described in 1932, is now a well recognized entity, which is diagnosed with the confirmatory laboratory evidence of elevated urinary 17-hydroxycorticoid excretion. Surgical treatment is now generally accepted in the management of these patients, and consists of surgical excision of hyperfunctional adrenal tissue. Other adrenocortical lesions, particularly tumors, with or without hormonal effects, are now well differentiated. More precise knowledge of the functional tumors has permitted their classification into distinct clinical groups. Subtotal or total adrenalectomy is now an accepted procedure in patients with bilateral adrenal hyperplasia or adrenal tumors.

Early work in this field of surgery furnished eloquent demonstration of the necessity for exceedingly careful preoperative and postoperative study and control by adequate adrenal replacement therapy. Since, because of its anatomic location in the retroperitoneal space, the adrenal gland naturally falls into the domain of the urologic surgeon, the latter must assume a tremendous burden of responsibility in informing himself of new knowledge concerning adrenal physiology and pathology, and must keep abreast of the latest developments in medical endocrinology that will contribute to the well-being and recovery of patients subjected to adrenal operations.

Pheochromocytomas. That pheochromocytomas involving the medulla of the adrenal gland may be associated with persistent or paroxysmal hypertension is now well appreciated, and numerous cases of patients successfully treated by surgery have been reported during the past 20 years. In 1950, Smithwick collected 270 cases, but in 67 per cent the lesion of the adrenal gland had been demonstrated only at autopsy. This proportion, no doubt, has been greatly decreased during the past few years, for clinical recognition and treatment of these lesions has steadily advanced. The presacral insufflation of gas has been a valuable aid in the roentgenologic diagnosis of these tumors. Employment of other diagnostic procedures, such as the histamine test, or the use of benzodioxane or dibenamine, are now routine in cases in which a pheochromocytoma is suspected. The latter drugs are used also before and during the operative procedure to control the arterial pressure.

Hypertension. In view of the vasoconstricting effect of adrenalin, which has been familiar and widely applied in the control of surgical hemorrhage since this substance was first isolated from the adrenal medulla by Abel in 1898, the idea of correcting hypertension by surgical attack on the adrenal glands has been appealing to imaginative and daring surgeons. In the 1930's, George Crile, Sr., guided by the belief that the future role of surgery lay in its correction and counteraction of pathologic physiology, made an exhaustive clinical study of adrenal denervation. In 1935, he postulated certain indications and contraindications for this procedure, and in 1937, he advocated unilateral adrenalectomy and partial resection of the other gland to control hypertension. The work of Adson, Smithwick, and others on sympathectomy, which was begun about the same time, however, was more generally accepted as the surgical procedure of choice for hypertension.

Since adrenal surgery has had a new impetus in the postcortisone era, attention has again turned to the possibility of controlling hypertension by bilateral adrenalectomy. Its value is still a controversial issue. According to Harrison, the results depend largely on a very careful selection of patients, since the risks of adrenal surgery are much increased in patients with malignant vascular disease. In the relatively small series of patients subjected to adrenalectomy so far reported, decrease in the blood pressure, improvement in the functional capacity, or both, have been noted in more than one-half.

Control of malignant disease. The possible role of adrenalectomy in the treatment of patients with prostatic carcinoma when a relapse occurs fol-

lowing orchiectomy or estrogen therapy, as suggested by Huggins in 1951, has led to inquiry into the relation of adrenal hormones to the growth of carcinoma in other sites, particularly breast carcinoma, and at present clinical investigations along this line are in progress, augmented by much experimental research on animals. Whether adrenalectomy in these cases will prove to be a potent weapon in the control of certain types of cancer will be determined by these current studies.

Miscellaneous studies. The present active interest in the physiology and pathology of the adrenal glands has prompted experimental transplantation of adrenal tissue. In 1952, Kay studied homotransplantation of the adrenal glands in dogs and tested the efficacy of ACTH and cortisone, noting that these hormones had no noticeable effects on the survival of the transplanted tissue. Undoubtedly more transplantation experiments will be carried out in the immediate future, and from these and multiple other approaches to the problem, much will be learned which will have clinical bearing and will alter the procedures used in the day-to-day practice of urology. If this does not happen tomorrow, it surely will occur next week, next month, or next year!

Despite the excessive length of this review, it is no more than a flashback, or momentary glimpse, of the record of achievement in urology during the past half century. Each separate section and paragraph, if it had been covered in any kind of adequate way, would have consumed as much space as the entire review. To review the urologic literature of the past 50 years in detail would assume the proportions of a life work in itself. In this outline, in which only the peaks are visible (and no doubt many of them are lacking), it has been necessary to rely on earlier reviews, particularly the two volume *History of Urology*, edited by Bransford Lewis, which was published in 1933, and the 50 year review, covering the years from 1890 to 1940, by Hugh Young. To material gleaned from these surveys and other historical material have been added some of the salient developments of recent years.

As a final word, it seems appropriate to quote Hugh Young, who, 15 years ago started his article *Fifty Years' Progress in Urology* as follows: "To do justice to the remarkable advances made in urology during the past fifty years is an impossible task. There is no branch of medicine in which embryology, endocrinology, comparative and regional anatomy, bacteriology and other forms of laboratory investigation play so important a role. The *armamentarium urologicum* with the developments of cystoscopic instruments is a vast field in itself. The scientific papers on urologic subjects comprise hundreds of thousands of items. This survey, confined within the scope of a journal article, cannot include more than a small percentage of even the important papers. I am aware that many which should have been discussed have been missed."

To this, I shall add only a fervent *Amen!*

BIBLIOGRAPHY

1. Abel, J. J., and Rowntree, L. G. Pharmacologic action of some phthaleins. J. Pharm. Exp. Ther., August, 1909. Cited by Scholl, A. J., 1933.
2. Aberhart, C. Surgery of the scrotum, spermatic cord, testes and epididymis. In Campbell, M.: Urology. Vol. 3, pp. 2130–2146. Philadelphia and London: W. B. Saunders Co., 1954.
3. Albarran (1905): Cited by Young, H. H., 1941.
4. Albarran and Halle (1898). Cited by Young, H. H., 1941.
5. Albarran and Imbert (1903). Cited by Young, H. H., 1941.
6. Ask-Upmark, E. Über juvenile maligne Nephrosklerose und ihr Verhæltnis zu Stœrungen in der Nierenentwicklung. Acta path. microb. scand., 1929, 6: 383–442.
7. Ballenger, E. G. Bacteriology of urology. In Lewis, B.: History of Urology. Vol. 1, pp. 267–278. Baltimore: Williams & Wilkins Co., 1933.
8. Barker, N. W., and Walters, W. Hypertension associated with unilateral chronic atrophic pyelonephritis; treatment by nephrectomy. Proc. Mayo Clin., 1938, 13: 118–121.
9. Barney, J. D. (1913). Cited by Young, H. H., 1941.
10. Idem. Lithiasis. In Lewis, B.: History of Urology. Vol. 2, pp. 1–25. Baltimore: Williams & Wilkins Co., 1933.
11. Barney, J. D., and Jones, S. G. Frequency of bilateral renal tuberculosis. Boston M. & S. J., 1925, 193: 540–542.
12. Baron, E., and Angrist, A. Incidence of occult adenocarcinoma of the prostate after 50 years of age. Arch. Path., Chic., 1941, 32: 787–793.
13. Baumrucker, G. O. A modification of the Nesbit resectoscope. J. Urol., Balt., 1946, 55: 567–569.
14. Beer, E. Removal of neoplasms of the urinary bladder. J. Am. M. Ass., 1910, 54: 1768–1769.
15. Idem. Discussions of advances in electrosurgery. Arch. Phys. Ther., 1931, 12: 461–467.
16. Beer and Hyman (1920). Cited by Young, H. H., 1941.
17. Belfield, W. T. Operative treatment of prostatic hypertrophy. Surg. Gyn. Obst., 1905, 1: 544–549.
18. Bergman, H. A new serial section biopsy instrument. J. Urol., Balt., 1947, 58: 93–95.
19. Berti, G. (1921). Cited by Mathé, C. P., 1933.
20. Birnie (1914). Cited by Young, H. H., 1941.
21. Bothe (1926). Cited by Young, H. H., 1941.
22. Boyce, W. H., and Vest, S. A. A new concept concerning treatment of exstrophy of the bladder. J. Urol., Balt., 1952, 67: 503–517.

23. Idem. Role of ammonia reabsorption in acid-base imbalance following ureterosigmoidostomy. J. Urol., Balt., 1952, 67: 169–178.
24. BOYD and LEWIS. Cited by Young, H. H., 1941.
25. BRAASCH, W. F. Deformities of the renal pelvis. Ann. Surg., 1910, 51: 534. Cited by Brown, P., 1933.
26. Idem. Recent developments in pyelography. Ann. Surg., 1910, 52: 645. Cited by Brown, P., 1933.
27. Idem. Clinical data on renal lithiasis. St. Louis J. Lancet, 1913, 33: 561. Cited by Brown, P., 1933.
28. Idem. Infections of the renal pelvis and ureter. Texas J. M., 1913–14, 9: 305. Cited by Brown, P., 1933.
29. Idem. Pyelography. Philadelphia: W. B. Saunders Co., 1915.
30. Idem. Median bar excisor. J. Am. M. Ass., 1918, 70: 758–759. Cited by Young, H. H., 1941.
31. BRAASCH, W. F., and CARMAN, R. (1919). Cited by Young, H. H., 1941.
32. BRAASCH, W. F. Urography. Philadelphia: W. B. Saunders Co., 1927.
33. BRAASCH, W. F., and JACOBSON, C. E. Chronic bilateral pyelonephritis and hypertension. J. Urol., Balt., 1940, 44: 571–579.
34. BRAASCH, W. F., WALTERS, W., and HAMMER, H. J. Hypertension and the surgical kidney. J. Am. M. Ass., 1940, 115: 1837–1841.
35. BRODERS, A. C. Epithelioma of the genito-urinary organs. Ann. Surg., 1922, 75: 574–604.
36. BROEDEL (1901). Cited by Young, H. H., 1941.
37. BROSTER and VINES (1933). Cited by Young, H. H., 1941.
38. BROWN, P. Radiologic diagnosis, in Glasser, O.: Science of Radiology. Springfield: C. C.Thomas, 1933.
39. BROWNE, D. Diagnosis of undescended testicle. Brit. M. J., 1938, 2: 168–171.
40. Idem. Operation for hypospadias. Proc. R. Soc. M., Lond., 1949, 42: 466–468.
41. Idem. Treatment of undescended testicle. Proc. R. Soc. M., Lond., 1949, 42: 643–645.
42. BUCKNALL (1907). Cited by Young, H. H., 1941.
43. BUERGER, L. A new indirect irrigating observation and double catheterizing cystoscope. Ann. Surg., 1909, 50: 225–237.
44. BUGBEE, H. G. Relief of vesical obstruction. N. York State M. J., 1913, 13: 410–417.
45. Idem. Conservation in urology. J. Urol., Balt., 1933, 30: 381–401.
46. BUMPUS, H. C., JR. Results of punch prostatectomy. J. Urol., Balt., 1926, 16: 59–66.
47. Idem. Anesthesia in urology. In Lewis, B.: History of Urology, 1933. Baltimore: Williams & Wilkins Co., 1933.
48. BUNGE, R. G., and KRAUSHAAR, O. F. Abnormal renal cytology. J. Urol., Balt., 1950, 63: 464–474.
49. BURNHAM. Cited by Young, H. H., 1941.
50. BURNS (1916). Cited by Brown, P., 1933.
51. Idem (1917). Cited by Young, H. H., 1941.
52. BUTLER, A. M., WILSON, J. L., and FARBER, S. Dehydration and acidosis with calcification at renal tubules. J. Pediat., S. Louis., 1936, 8: 489–499.
53. BUTLER, A. M. Chronic pyelonephritis and arterial hypertension. J. Clin. Invest., 1937, 16: 889–897.
54. BUTT, A. J., HAUSER, E. A., SEIFTER, J., and PERRY, J. G. Prevention and treatment by increasing protective urinary colloids with hyaluronidase. In press.
55. BUTTERFIELD, P. M. A new children's cysto-urethroscope. J. Urol., Balt., 1929, 22: 347–350.
56. Idem. A new female urethroscope and infant vaginoscope. J. Urol., Balt., 1935, 33: 310–314.
57. CAHILL, G. F., and Others. Adrenal cortical tumors. Surg. Gyn. Obst., 1936, 62: 287–313.
58. CAHILL, G. F. Roentgenography: Perirenal insufflation. In Glasser, O.: Medical Physics. Chicago: Year Book Publishers, Inc., 1944.
59. Idem. Pheochromocytomas. J. Am. M. Ass., 1948, 138: 180–186.
60. Idem. Adrenalectomy for adrenal tumors. Tr. Am. Ass. Genitourin. Surgeons, 1952, 44: 105.
61. Idem. Surgery involving the adrenals. N. York State M. J., 1953, 53: 308–317.
62. CAMERINI, R., ZAFFAGNINI, V., and LOLLI, G. Tomography as a means of studying the bladder walls. Radiol. clin., 1953, 22: 421–424.
63. CAMERON (1918). Cited by Brown, P., 1933.
64. CAMPBELL, M. Three miniature cysto-urethroscopes. J. Urol., Balt., 1936, 36: 183–188.
65. Idem. Primary megaloureter. J. Urol., Balt., 1952, 68: 584–590.
66. Idem. Urology. (3 vols.). Philadelphia: W. B. Saunders Co., 1954.
67. CARELLI and SORDELLA. Un nuevo procedimiento para explorar el riñon, Rev. As. méd. Argent., 1921, 24: 424. Cited by Brown, P., 1933.
68. CASH (1924). Cited by Young, H. H., 1941.
69. CASTIGLIONI, A. A History of Medicine. New York: Alfred A. Knopf, 1941.
70. CAULK, J. R. (1918). Cited by Young, H. H., 1941.
71. Idem. Presentation of a cautery punch for removal of minor obstructions at vesical neck with a new method of anesthesia. South. M. J., 1921, 14: 816.
72. Idem. Effects of use of cautery punch operation on necessity for prostatectomy; presentation of new cystoscopic irrigating fulgurating attachment to cautery punch insuring double visualization. J. Am. M. Ass., 1932, 99: 1828–1832.
73. Idem. Outstanding contributions to urology, in Lewis, B.: History of Urology. Vol. 2, pp. 55–90. Baltimore: Williams & Wilkins Co., 1933.
74. Idem. Obstructions at the bladder neck in infants and children. South, M. J., 1936, 29: 142–147.
75. Idem. Urinary obstructions in infants and children. Surg. Gyn. Obst., 1936, 63: 80–85.
76. CECIL, A. B. Repair of hypospadias and urethral fistula. J. Urol., Balt., 1946, 56: 237–242.
77. Idem. Surgery of the penis and urethra. In Campbell, M.: Urology. Vol. 3, pp. 2081–2129. Philadelphia and London: W. B. Saunders Co., 1954.
78. CHAPPIUS and CHAUVEL (1896). Cited by Brown, P., 1933.
79. CHEVASSU (1910). Cited by Young, H. H., 1941.
80. CHILDS and SPITZER (1913). Cited by Brown, P., 1933.
81. CHUTE (1920). Cited by Young, H. H., 1941.
82. CHUTE, R., and SOUTTER, L. Thoraco-abdominal nephrectomy for large kidney tumors. J. Urol., Balt., 1949, 61: 688–696.
83. CHWALLA (1927). Cited by Young, H. H., 1941.
84. CLEAVES (1903). Cited by Corbus, 1933.
85. COFFEY (1910 and 1913). Cited by Young, H. H., 1941.
86. COFFEY, R. C. Further studies and experiences with transfixion suture technic (technic 3) for transplantation of ureters into the large intestine. Northwest M., 1933, 32: 31–34.
87. Idem. Cystectomy for carcinoma of the bladder; report of cases. Am. J. Surg., 1933, 20: 254–297.
88. COLBY, F. H. Tuberculous infections and inflammations of the urinary tract. In Campbell, M.: Urology. Vol. 1, pp. 525–559. Philadelphia and London: W. B. Saunders Co., 1954.
89. COLLINGS, C. W. Electrotome excision of prostatic bar. J. Am. M. Ass., 1928, 90: 438–441.

90. Colston, J. A. C. Perineal prostatectomy. In Campbell, M.: Urology. Vol. 3, pp. 1971–2014. Philadelphia: W. B. Saunders Co., 1954.
91. Cook, E. N. Urinary infections, in Campbell, M.: Urology, vol. 1, pp. 503–524, Philadelphia and London: W. B. Saunders Co., 1954.
92. Coppridge, W. M., Roberts, L. C., and Rosser, R. G., Jr. Direct manipulation of ureteral stones through the urethra. J. Urol., Balt., 1948, 60: 418–419.
93. Corbus, B. C. Tumors of the bladder. In Lewis, B.: History of Urology. Vol. 2, pp. 291–304. Baltimore: Williams & Wilkins Co., 1933.
94. Councill, W. A. New ureteral stone extractor and dilator. J. Am. M. Ass., 1926, 86: 1907–1908.
95. Counseller and Horner. Cited by Young, H. H., 1941.
96. Crabtree, E. G., and Chaset, N. Vascular nephritis and hypertension; combined clinical and clinicopathologic study of 150 nephrectomized patients. J. Am. M. Ass., 1940, 115: 1842–1846.
97. Creevy, C. D. The care of the urological patient before and after operation. In Campbell, M.: Urology, vol. 3, pp. 1701–1756. Philadelphia and London: W. B. Saunders Co., 1954.
98. Crile, G. W. Kinetic system and its control, South. Surgeon, 1932, 1: 157–161.
99. Idem. Indications and contraindications for denervation of the adrenal glands. Ann. Surg., 1934, 100: 667–669.
100. Crowell, A. J. Surgery of the ureter. In Lewis, B.: History of Urology. Vol. 2, pp. 321–343. Baltimore: Williams & Wilkins Co., 1933.
101. Cullen and Derge (1909). Cited by Young, H. H., 1941.
102. Cunningham (1910). Cited by Brown, P., 1933.
103. Cushing, H. Basophil adenomas of pituitary body and their clinical manifestations (pituitary basophilism). Bull. Johns Hopkins Hosp., 1932, 50: 137–195.
104. Davis, D. M., Strong, G. H., and Drake, W. M., Jr. Intubated ureterotomy; experimental work and clinical results. J. Urol., Balt., 1948, 59: 851–862.
105. Davis, D. M. Intubated ureterotomy. South. M. J., 1951, 44: 275–285.
106. Dean, A. L., Jr. Treatment of bladder cancer with external irradiation. Ann. Surg., 1935, 101: 1428–1432.
107. Idem. Teratoid tumors of the testis. J. Am. M. Ass., 1935, 105: 1965–1991.
108. Dean, A. L. Tumors of the penis, urethra, scrotum and testis. In Campbell, M.: Urology. Vol. 2, pp. 1177–1230. Philadelphia and London: W. B. Saunders Co., 1954.
109. Idem. Radiation treatment of tumors of the genitourinary organs. In Campbell, M.: Urology. Vol. 3, pp. 2147–2166. Philadelphia and London: W. B. Saunders Co., 1954.
110. Deming, C. L. Hormonal and surgical bases for treatment of undescended testis. Am. J. Surg., 1937, 38: 186–191.
111. Idem. Tumors of the kidney. In Campbell, M.: Urology. Vol. 2, pp. 953–1020. Philadelphia and London: W. B. Saunders Co., 1954.
112. Doss, A. K. Translumbar aortagraphy; its diagnostic value in urology. J. Urol., Balt., 594–606, June, 1946, 55: 594–606.
113. Einhorn (1904). Cited by Young, H. H., 1941.
114. Engle, E. T. Action of extracts of anterior pituitary and of pregnancy urine on testes of immature rats and monkeys. Endocrinology, 1932, 16: 506–512.
115. Idem. Experimentally induced descent of testis in Macacus monkey by hormones from anterior pituitary and pregnancy urine; role of gonadokinetic hormones in pregnancy blood in normal descent of testes in man. Endocrinology, 1932, 16: 513–520.
116. Engle, E. T., and Jailer, J. W. Endocrinology in urology. In Campbell, M.: Urology. Vol. 3, pp. 1667–1700. Philadelphia and London: W. B. Saunders Co., 1954.
117. Ewing (1911). Cited by Young, H. H., 1941.
118. Fenwick (1905). Cited by Brown, P., 1933.
119. Ferguson, R. S. Behavior of hormone of anterior hypophysis in case of teratoma testis. Am. J. Roentg., 1933, 29: 443–448.
120. Foley, F. E. B. Operative division of horseshoe kidney; report of five cases with exhibition of preoperative and postoperative pyelo-ureterograms. Minnesota M., 1935, 18: 176–182.
121. Idem. Management of ureteral stone; operation versus expectancy and manipulation. J. Am. M. Ass., 1935, 104: 1314–1318.
122. Idem. Aseptic ureterosigmoidostomy; new method providing definite asepsis in respect of both fecal and urinous soiling; preliminary report. Surgery, 1937, 2: 18–25.
123. Idem. A new plastic operation for stricture at the ureteropelvic junction; report of 20 operations. J. Urol., Balt., 1937, 38: 643–672.
124. Folin (1905). Cited by Castiglioni, A., 1941.
125. Frater, K., and Braasch, W. F. Incidence of stricture of the ureter. Surg. Gyn. Obst., 1929, 48: 390–396.
126. Garceau (1909). Cited by Young, H. H., 1941.
127. Geraghty (1915). Cited by Young, H. H., 1941.
128. Gibson (1910). Cited by Young, H. H., 1941.
129. Gibson, T. E. Tumors of the seminal vesicles. In Campbell, M.: Urology. Vol. 2, pp. 1170–1176. Philadelphia and London: W. B. Saunders Co., 1954.
130. Idem. Tumors of the spermatic cord, epididymis and testicular tunics. In Campbell, M.: Urology. Vol. 2, pp. 1232–1254. Philadelphia and London: W. B. Saunders Co., 1954.
131. Idem. Surgery of the seminal vesicles. In Campbell, M.: Urology. Vol. 3, 2069–2080. Philadelphia and London: W. B. Saunders Co., 1954.
132. Gilchrist, R. K., Merricks, J. W., Hamlin, H. H., and Rieger, I. T. Construction of substitute bladder and urethra. Surg. Gyn. Obst., 1950, 90: 752–760.
133. Glasser, O. Science of Radiology. Springfield: C. C. Thomas, 1933.
134. Idem. Medical Physics. Chicago: Year Book Publishers, 1944.
135. Godlowski, Z. Z. Value of perirenal insufflation of air as diagnostic method of estimating gross anatomic enlargement of the suprarenals and kidneys. J. Fac. Radiol., 1953, 5: 148–154.
136. Goettsch, E. Nephritis and allied diseases in infants and children. In Campbell, M.: Urology. Vol. 3, pp. 2223–2282. Philadelphia and London: W. B. Saunders Co., 1954.
137. Goldblatt, H. Studies on experimental hypertension; production of persistent hypertension in monkeys (macaque) by renal ischemia. J. Exp. M., 1937, 65: 671–675.
138. Goldring, W. Hypertension and nephritis. In Campbell, M.: Urology. Vol 3, pp. 2167–2222. Philadelphia: W. B. Saunders Co., 1954.
139. Goldzieher, M. A., and Koster, H. Adrenal cortical hyperfunction. Am. J. Surg., 1935, 27: 93–106.

140. GRANGER. Cited by Brown, P., 1933.
141. GRAY, A. L. Treatment of malignant diseases of the bladder through suprapubic incision with report of a case. Am. Q. Roentgenol., 1907, 1: 2–53.
142. GUTIERREZ, R. Transurethral treatment of bladder neck obstructions; endoscopic prostatic resections. In Lewis, B.: History of Urology. Vol. 2, pp. 137–186. Baltimore: Williams & Wilkins Co., 1933.
143. HAGNER (1914). Cited by Young, H. H., 1941.
144. HAINES, W. D. Prostatectomy. Surg. Gyn. Obst., 1905, 1: 440–441.
145. HARRISON, J. H., and JENKINS, D. The Adrenals. In Campbell, M.: Urology. Vol. 3, pp. 2283–2351. Philadelphia and London: W. B. Saunders Co., 1954.
146. HARRISON, T. R., BLALOCK, A., and MASON, M. F. Effects on blood pressure of injection of kidney extracts of dogs with renal hypertension. Proc. Soc. Exp. Biol., N. Y., 1936, 35: 38–40.
147. HERBST, R. H., and POLKEY, H. J. Prostatic malignancy. In Lewis, B.: History of Urology. Vol. 2, pp. 187–208. Baltimore: Williams & Wilkins Co., 1933.
148. HIGGINS, C. C. Transuretero-ureteral anastomosis; report of clinical case. Tr. Am. Ass. Genitourin. Surgeons, 1934, 27: 279–285.
149. Idem. Medical management of urinary lithiasis. Med. Ann. District of Columbia, 1935, 4: 63–66.
150. Idem. Production and solution of urinary calculi; experimental and clinical studies. J. Am. M. Ass., 1935, 104: 1296–1299.
151. Idem. Aseptic uretero-intestinal asastomosis. Urol. Cut. Rev., 1935, 39: 76–81.
152. Idem. Ureteral transplantation for exstrophy and carcinoma of bladder. Cleveland Clin. Q., 1935, 2: 32–42.
153. Idem. Prevention of recurrent renal calculi. Surg. Gyn. Obst., 1936, 63: 23–34.
154. Idem. Renal lithiasis. Springfield, Ill.: Charles C. Thomas, 1943.
155. Idem. Cystoscope. In Glasser, O.: Medical Physics. Chicago: Year Book Publishers Inc., 1944.
156. Idem. Urolithiasis. In Campbell, M.: Urology. Vol. 1, pp. 767–842. Philadelphia and London: W. B. Saunders Co., 1954.
157. Idem. Uretero-pelviostomy. Urologia, Treviso., 1954, 21: 274–277.
158. Hinman, F. (1913). Cited by Young, H. H., 1941.
159. Idem. (1918). Cited by Young, H. H., 1941.
160. Idem. Tumors of the testis; five-year cures following radical operation. Surg. Gyn Obst., 1933, 56: 450–461.
161. Idem. Principles and Practice of Urology. Philadelphia: W. B. Saunders Co., 1935.
162. HINMAN, F., JR. The pathology of urinary obstruction. In Campbell, M.: Urology. Vol. 1, pp. 201–226. Philadelphia and London: W. B. Saunders Co., 1954.
163. HOLMES, G. (1924). Cited by Young, H. H., 1941.
164. HOTCHKISS, R. S. Infertility in the male. In Campbell, M.: Urology. Vol. 1, pp. 733–766. Philadelphia and London: W. B. Saunders Co., 1954.
165. HOWARD. Cited by Young, H. H., 1941.
166. HUGGINS, C. Physiology of the prostate and seminal vesicles. In Campbell, M.: Urology. Vol. 1, pp. 111–122. Philadelphia and London: W. B. Saunders Co., 1954.
167. HUGGINS, C., and BERGENSTAL, D. M. Surgery of the adrenals. J. Am. M. Ass., 1951, 147: 101–106.
168. HUGGINS, C., MASINA, M. H., EICHELBERGER, L., and WHARTON, J. D. Quantitative studies of prostatic secretion; characteristics of normal secretion; influence of thyroid, suprarenal and testis extirpation and androgen substitution on prostatic output. J. Exp. M., 1939, 70: 543–556.
169. HUNNER (1911). Cited by Young, H. H., 1941.
170. HUNT, V. C. Cited by Young, H. H., 1941.
171. Idem. Papillary epithelioma of the renal pelvis, J. Urol., Balt., 1927, 18: 225–246.
172. Idem. Prostatism and prostatic surgery. In Lewis, B.: History of Urology. Vol. 2, pp. 91–136. Baltimore: Williams & Wilkins Co., 1933.
173. HYMAN (1928). Cited by Young, H. H., 1941.
174. ISRAEL (1911). Cited by Young, H. H., 1941.
175. JANEWAY (1909). Cited by Young, H. H., 1941.
176. JARMAN, W. D., and SCOTT, W. W. Introduction of avertin as relaxing agent in manipulative removal of ureteral calculi. J. Urol., Balt., 1937, 38: 111–117.
177. JEWETT, H. J. Spontaneous rupture of hydronephrotic kidney associated with primary carcinoma of ureter. J. Urol., Balt., 1940, 43: 664–668.
178. Idem. Infiltrating carcinoma of the bladder; relation of early diagnosis to 5-year survival rate after complete extirpation. J. Am. M. Ass., 1952, 148: 187–189.
179. Idem. Carcinoma of the bladder: influence of depth of infiltration on 5-year results following a complete extirpation of primary growth. J. Urol., Balt., 1952, 67: 672–680.
180. Idem. Tumors of the bladder. In Campbell, M.: Urology. Vol. 2, pp. 1044–1094. Philadelphia and London: W. B. Saunders Co., 1954.
181. JOELSON, J. J., PERSKY, L., and ROSE, F. A. Radiographic diagnosis of tumors of the adrenal gland. Radiology, 1954, 62: 488–495.
182. JOHNSON, F. P. A new method of removing ureteral calculi. J. Urol., Balt., 1937, 37: 84–89.
183. JUDD, E. S. (1913). Citation by Young, H. H., 1941.
184. Idem. (1916). Cited by Young, H. H., 1941.
185. JUDD, E. S., and SCHOLL, A. J. Cited by Young, H. H., 1941.
186. KAUFMAN. Cited by Young, H. H., 1941.
187. KAY, J. H. Influence of cortisone and ACTH on survival of adrenal homotransplants in the dog. 1952, 32: 686–688.
188. KELLY. Cited by Young, H. H., 1941.
189. KELLY and LEWIS (1913). Cited by Brown, P., 1933.
190. KENNETH-WALKER. Cited by Young, H. H., 1941.
191. KEYES (1909). Cited by Brown, P., 1933.
192. Idem. (1910). Cited by Young, H. H., 1941.
193. KEYES, E. L. Treatment of tuberculosis of the bladder and epididymis. South. M. J., 1928, 21: 223–227.
194. KEYSER, L. D., SCHERER, P. C., and CLAFFEY, L. W. Studies in dissolution of urinary calculi; experimental and clinical aspects. J. Urol., Balt., 1948, 59: 826–841.
195. KIMBALL, F. N., and FERRIS, H. W. Papillomatous tumor of the renal pelvis associated with similar tumors of the ureter and bladder; review of literature and report of two cases. J. Urol., Balt., 1934, 31: 257–304.
196. KIRWIN, T. J. A new cystoscopic rongeur. Am. J. Surg., 1930, 9: 329.
197. Idem. Vesical neck obstruction. Surg. Gyn. Obst., 1931, 52: 1007–1019.
198. Idem. Evolution of vesical neck resection; past results, future problems, and use of author's resectoscope. J. Urol., Balt., 1932, 28: 539–544.
199. Idem. Lithotrite, in Lowsley, O. S. and Kirwin, T. J. Clinical Urology. 2nd ed. Baltimore: Williams and Wilkins, 1944.

200. Idem. Lithotrites and rongeurs. In Glasser, O.: Medical Physics. pp. 1618–1621. Chicago: Year Book Publishers, Inc., 1944.
201. Idem. A new cystoscope. J. Urol., Balt., 1946, 55: 208–211.
202. KLOSE (1904). Cited by Brown, P., 1933.
203. KOLFF, W. J. Modern therapy of uremia, especially peritoneal lavage and treatment with artificial kidney. Belg. tschr. geneesk., 1946, 2: 449–463.
204. KRETSCHMER. Cited by Young, H. H., 1941.
205. KRETSCHMER, H. L. Diverticulum of bladder in infancy and in childhood. Am. J. Dis. Child., 1934, 48: 842–857.
206. KUNSTADTER, R. H. Technique for diagnosis of undescended testis. J. Am. M. Ass., 1952, 148: 117.
207. LADD, W. E., and WHITE, R. R. Embryoma of the kidney (Wilm's tumor). J. Am. M. Ass., 1941, 117: 1858–1863.
208. LANGERON, L., DECHERF, E., and DANES. Épithélioma cortico-surrénal avec virilisme et hirsutisme; localisation par le pneumo-péritoine; extirpation chirurgicale, Bull. Soc. med. hop. Paris, 1929, 53: 436. Cited by Cahill, 1944.
209. LEADBETTER and BURKLAND. Cited by Young, H. H., 1941.
210. LEGUEU (1915). Cited by Young, H. H., 1941.
211. LEITHAUSER, D. J. Early Ambulation and Related Procedures in Surgical Management. Springfield, Ill.: Charles C. Thomas, 1946.
212. LEONARD, L. Cited by Brown, P., 1933.
213. LEWIS, B. History of Urology. 2 Vols., Baltimore: Williams and Wilkins Co. 1933.
214. Idem. Cited by Young, H. H., 1941.
215. LEWIS, L. G. A new clinical recording cystometer. J. Urol., Balt., 1939, 41: 638–645.
216. LICHTENBERG, A. VON, and SWICK, M. Klinische Pruefung des Uroselectans. Klin. Wschr., 1929, 8: 2089.
217. LIEBERTHAL (1938). Cited by Young, H. H., 1941.
218. LIGHTWOOD, R. Some points in diagnosis and treatment of diseases in childhood. Lancet Lond., 1935, 2: 851–852.
219. LILIENTHAL and PILCHER (1914). Cited by Young, H. H., 1941.
220. LONGCOPE and WINKENWERDER (1933). Cited by Young, H. H., 1941.
221. LOWER, W. E. The diagnosis and treatment of some surgical diseases of the urinary bladder. Surg. Gyn. Obst., 1905, 1: 336–350.
222. Idem. (1913). Cited by Young, H. H., 1941.
223. Idem. (1914). Cited by Young, H. H., 1941.
224. LOWSLEY, O. S. A new forward-looking urethroscope. J. Urol., Balt., 1933, 30: 661.
225. Idem. A new device for securing a biopsy specimen. J. Urol., Balt., 1935, 33: 417.
226. Idem. Straight tractor; a new tractor for use in total perineal prostatectomy. J. Urol., Balt., 1941, 46: 70–71.
227. Idem. Long curved tractor for prostatectomy. In Lowsley, O. S. and Kirwin, T. J. Clinical Urology. 2nd. ed. Baltimore: Williams & Wilkins Co., 1944.
228. Idem. Grasping forceps. In: Clinical Urology. 2nd. ed. Baltimore: Williams & Wilkins Co., 1944.
229. LOWSLEY, O. S., and BISHOP, C. C. New method of repairing kidney wounds. Surg. Gyn. Obst., 1933, 57: 494–500.
230. LOWSLEY, O. S., and CONROY, F. Aberrant ureter; treatment. J. Urol., Balt., 1942, 48: 611–621.
231. LOWSLEY, O. S., and PETERSON, A. The Lowsley-Peterson universal endoscope (direct vision). Am. J. Surg., 1938, 39: 168–171.
232. LUNDY, J. S. Comparative value of ethylene as an anesthetic. J. Am. M. Ass., 1924, 83: 350–355.
233. Idem. Intravenous anesthesia; preliminary report of use of two new thiobarbiturates. Proc. Mayo Clin., 1935, 10: 536–543.
234. MACINTYRE (1896). Cited by Brown, P., 1933.
235. MARK, E. G. Cystoscopy and urethroscopy. In Lewis, B.: History of Urology. Vol. 1, pp. 160–172. Baltimore: Williams & Wilkins Co., 1933.
236. MATHE, C. P. Kidney surgery. In Lewis, B.: History of Urology. Vol. 1, pp. 279–385. Baltimore: Williams & Wilkins Co., 1933.
237. Idem. Present day status of treatment of hypertrophy by means of the operative cystoscope. Urol. Cut. Rev., 1932, 36: 156–162.
238. MAYO, C. H. Cited by Corbus, 1933 and by Young, 1944.
239. Idem. Old and new in prostatic surgery. Ann. Surg., 1934, 100: 883–886.
240. MAYO, W. J. (1912). Cited by Young, H. H., 1941.
241. Idem. (1915). Cited by Young, H. H., 1941.
242. MCCALLUM. Cited by Young, H. H., 1941.
243. MCCARTHY, J. F. A new type of observation and operating cysto-urethroscope (pan-endoscope). J. Urol., Balt., 1923, 10: 519–523.
244. Idem. A consideration of the newer diagnostic and surgical procedures in the bladder and posterior urethra. Proc. Interst. Postgrad. M. Ass. N. America, 1928, 197–199.
245. Idem. A new apparatus for endoscopic plastic surgery of the prostate; diathermia and excision of vesical growths. J. Urol., Balt., 1931, 26: 695.
246. Idem. The prostate at the crossroad. Am. J. Surg., 1932, 15: 435–440.
247. Idem. Recent advances in instrumental urology. J. Urol., Balt., 1935, 33: 303–309.
248. Idem. Further developments in surgery of the prostate, J. Urol., Balt., 1937, 37: 18–34.
249. Idem. A new visual system for observation and operation in the urinary bladder. J. Urol., Balt., 1947, 57: 575–578.
250. Idem. New modalities in urology. J. Urol., Balt., 1949, 61: 104–110.
251. Idem. Present concepts and future prospects of precision urology. J. Urol., Balt., 1951, 65: 1050–1055.
252. MCCARTHY, J. F., and RITTER, J. S. Seminal vesicles; newer instrumental methods in diagnosis and therapeutic management. J. Am. M. Ass., 1932, 98: 687–691.
253. MCCREA, L. E. A new infant cystoscope, J. Urol., Balt., 1947, 58: 217.
254. MEDLAR (1926). Cited by Young, H. H., 1941.
255. MELICK, W. F. Needle biopsy of the prostate; a new needle biopsy instrument. J. Urol., Balt., 1951, 66: 408–411.
256. MELTZER. Cited by Young, H. H., 1941.
257. MEYER, W. The choice of method in operating on the hypertrophied prostate. Surg. Gyn. Obst., 1905, 1: 462–463, 558–559.
258. MILLER, H. E. Modification of Nesbit resectoscope. J. Urol., Balt., 1952, 67: 531–532.
259. MILLIN, T. Retropubic prostatectomy. In Campbell, M.: Urology. Vol. 3, pp. 2046–2068. Philadelphia and London: W. B. Saunders Co., 1954.
260. MOORE, C. R.: Physiology of the testis and scrotum. In Campbell, M.: Urology. Vol. 1, pp. 123–142. Philadelphia and London: W. B. Saunders Co., 1954.
261. MOORE, K. L., GRAHAM, M. A., and BARR, M. L. The diagnosis of chromosomal sex in hermaphrodites from a skin biopsy. Surg., Gyn. Obst., 1953, 96: 641–648.
262. MOORE, T. D. Surgery of the ureter. In Campbell, M.: Urology. Vol. 3, pp. 1843–1889. Philadelphia and London: W. B. Saunders Co., 1954.

263. MORTON, W. P. Ureteral stone basket. J. Urol., Balt., 1948, 60: 242–243.
264. MUNRO, D. Urinary bladder; tidal drainage. In Glasser, O.: Medical Physics. pp. 1601–1609. Chicago: Year Book Publishers, Inc. 1944.
265. NAGAMATSU, G. Dorso-lumbar approach to the kidney and adrenal with osteoplastic flap. J. Urol., Balt., 1950, 63: 569–574.
266. NELSON, O. A. Arteriography of abdominal organs by aortic injections. Surg. Gyn. Obst., 1942, 74: 655–662.
267. NELSON, W. Personal communication.
268. NESBIT, R. M. Modification of the Stern-McCarthy resectoscope permitting third dimensional perception during transurethral prostatectomy. J. Urol., Balt., 41: 1939, 41: 646–648.
269. Idem. Transurethral Prostatectomy. Springfield, Ill.: Charles C Thomas, 1943.
270. Idem. Transurethral prostatic resection. in Campbell, M.: Urology. Vol. 3, pp. 2015–2045, 1954.
271. NICOLAIER. Cited by Young, H. H., 1941.
272. NIXON (1929). Cited by Young, H. H., 1941.
273. NORDMARK, B. Double formations of the pelvis of the kidneys and the ureters. Acta radiol., Stockholm, 1948, 30: 267. Cited by Campbell, M., Vol. 1, 1954.
274. O'CONOR, V. J. Suprapubic prostatectomy. In Campbell, M.: Urology. Vol. 3, pp. 1947–1970. Philadelphia and London: W. B. Saunders Co., 1954.
275. ODEL, H. M., and FERRIS, D. O. Treatment of acute renal insufficiency with peritoneal lavage. Proc. Mayo Clin., 1947, 22: 305–313.
276. OMBREDANNE (1911). Cited by Young, H. H., 1941.
277. PAPANICOLAOU, G. N. A new procedure for staining vaginal smears. Science, 95: 1942, 95: 438–439.
278. PASTEAU. Cited by Young, H. H., 1941.
279. PASTEAU and DE GRAIS. Cited by Young, H. H., 1941.
280. PERSSON. Cited by Young, H. H., 1941.
281. PETERS, H. Prostatic smear. Cancer, Phila., 1950, 3: 481–487.
282. PFAHLER. Cited by Brown, P., 1933.
283. PITTS, R. F. The elements of renal function. In Campbell, M.: Urology. Vol. 1, pp. 36–60. Philadelphia and London: W. B. Saunders Co., 1954.
284. POUSSON (1902). Cited by Young, H. H., 1941.
285. PRIESTLEY, J. T. Surgery of the kidney. In Campbell, M.: Urology. Vol. 3, pp. 1777–1842. Philadelphia and London: W. B. Saunders Co., 1954.
286. PRINTZMETAL and FRIEDMAN (1910). Cited by Young, H. H., 1941.
287. QUINBY (1925). Cited by Young, H. H., 1941.
288. RAFIN (1905). Cited by Corbus, 1933.
289. Idem. Cited by Young, H. H., 1941.
290. RANDALL, A. Initiating lesions of renal calculus. Surg. Gyn. Obst., 1937, 64: 201–208.
291. RANDALL, A., and BOTHE, A. E. Value of preoperative irradiation in tumor of the testis. Ann. Surg., 1937, 105: 385–391.
292. RANDALL, A., and CAMPBELL, E. W. Anomalous relationship of right ureter to vena cava. J. Urol., Balt., 1935, 34: 565–583.
293. RAVICH, A. A new lithotriptoscope. J. Urol., Balt., 1928, 20: 143.
294. Idem. A new improved cystoscope. J. Urol., Balt., 1928, 20: 511–516.
295. RIBA, L. W. Urinary strictures. In Glasser, O.: Medical Physics. pp. 1609–1610, Chicago: The Year Book Publishers, Inc., 1944.
296. RICH, A. R. On frequency of occurrence of occult carcinoma of the prostate. J. Urol., Balt., 1935, 33: 215–223.
297. RIVAS, R. Roentgen diagnosis: pneumokidney; original technic. Arch. españ. urol., 1948, 4: 228–233.
298. ROSE, D. K. A visual prostatic punch. Surg. Gyn. Obst., 1925, 41: 109.
299. Idem. Cystometry. In Glasser, O., Medical Physics. pp. 295–299. Chicago: The Year Book Publishers, Inc., 1944.
300. ROSENO. Cited by Brown, P., 1933.
301. ROSENSTEIN (1921). Cited by Brown, P., 1933.
302. ROVENSTINE, E. A., and HERSHEY, S. G. Anesthesia in urology. In Campbell, M.: Urology. Vol. 3, pp. 1757–1776. Philadelphia and London: W. B. Saunders Co., 1954.
303. ROWNTREE, L. G., and GERAGHTY, J. T. The functional activity of the kidney. J. Pharm. Exp. Ther., 1910, 1: 579–661.
304. ROWNTREE, L. G., and others. Roentgenography of the urinary tract during excretion of sodium iodide, J. Am. M. Ass., 1923, 80: 368–373.
305. DOS SANTOS, R., LAMAS, C., and CALDAS, P. Les récents progrès dans la technique de l'artériographie de l'aorte abdominale. Presse méd., 1931, 39: 574. Cited by Brown, P., 1933.
306. SCHATZ, A., BUGIE, E., and WAKSMAN, S. A. Streptomycin, substance exhibiting antibiotic activity against gram-positive and gram-negative bacteria. Proc. Soc. Exp. Biol., N.Y., 1944, 55: 66–69.
307. SCHOLL, A. J. Cited by Young, H. H., 1941.
308. Idem. Diagnosis in urology. In Lewis, B.: History of Urology. Vol. 1, pp. 173–182. Baltimore: Williams & Wilkins Co., 1933.
309. SCOTT, W. W. Primary carcinoma of the ureter. J. Urol., Balt., 1943, 50: 45–64.
310. Idem. Rotating resector: a modification of the Stern-McCarthy instrument. J. Urol., Balt., 1947, 57: 145–148.
311. SCOTT, WILLIAM W. Carcinoma of the prostate. In Campbell, M.: Urology. Vol. 2, pp. 1125–1169. Philadelphia & London: W. B. Saunders, Co., 1954.
312. SCOTT, WINFIELD W. Tumors of the ureter. In Campbell, M.: Urology. Vol. 2, pp. 1021–1043. Philadelphia and London: W. B. Saunders Co., 1954.
313. SELYE, H. General adaptation syndrome and the diseases of adaptation. J. Clin. Endocr., 1946, 6: 117–230.
314. SHAW, E. C. Study of the curve of elimination of phenolsulphonephthalein by normal and diseased kidneys, J. Urol., Balt., 1925, 13: 575.
315. Idem. Urology: Renal function tests. In Glasser, O., Medical Physics. pp. 1628–1630. Chicago: The Year Book Publishers, Inc. 1944.
316. SHORR, E. The possible usefulness of estrogens and aluminum hydroxide gels in the management of renal stone. J. Urol., Balt., 1945, 53: 507–520.
317. SHREIBER (1927). Cited by Young, H. H., 1941.
318. SMITH, P. G. Renal angiography (aortography). In Campbell, M.: Urology. Vol. 1, pp. 187–200. Philadelphia and London: W. B. Saunders Co., 1954.
319. SMITHWICK, R. H., GREER, W. E. R., ROBERTSON, C. W., and WILKINS, R. W. Pheochromocytoma; discussion of symptoms, signs and procedures of diagnostic value. N. England J. M., 1950, 242: 252–257.
320. SQUIER, J. B. (1911). Cited by Young, H. H., 1941.
321. STERN, M. The easy penetration of urethral strictures. J. Am. M. Ass., 1919, 73: 73.
322. Idem. Resection of obstructions at vesical orifice; new instruments, and new method. J. Am. M. Ass., 1926, 87: 1726–1729.

323. Stevens, R. A. On the value of cauterization by the high frequency current in certain cases of prostatic obstruction. N. York M. J., 1913, 98: 170–172.
324. Suby, H. I., and Albright, F. Dissolution of phosphatic urinary calculi by retrograde introduction of citrate solution containing magnesium. N. England J. M., 1943, 228: 81–91.
325. Sutherland. Cited by Young, H. H., 1941.
326. Swenson, O., MacMahon, H. E., Jaques, W. E., and Campbell, J. S. New concept of etiology of megaloureters. N. England J. M., 1952, 246: 41–46.
327. Swingle, W. W., and Pfiffner, J. J. Studies on adrenal cortex; further observations on preparation and chemical properties of cortical hormone. Am. J. Physiol., 1931, 98: 144–152.
328. Thomas, B. A., and Morgan, J. D. Roentgenology in urology. In Lewis, B.: History of Urology. Vol. 2, pp. 209–215. Baltimore: Williams & Wilkins Co., 1933.
329. Thomas, G. J. Urological instruments. In Lewis, B.: History of Urology. Vol. 2, pp. 354–361. Baltimore: Williams and Wilkins Co., 1933.
330. Thompson. Cited by Young, H. H., 1941.
331. Thompson, G. J. The urologic examination. In Campbell, M.: Urology. Vol. 1, 143–186. Philadelphia and London: W. B. Saunders Co., 1954.
332. Thomson, R. V., and Ash, J. E. Benign hyperplasia of the prostate gland. In Campbell, M.: Urology. Vol. 2, 1095–1124. Philadelphia and London: W. B. Saunders Co., 1954.
333. Tolson. Cited by Young, H. H., 1941.
334. Tuffier. Cited by Brown, P., 1933.
335. Uhle and Pfahler. Cited by Brown, P., 1933.
336. Van Slyke, D. D., and others. Studies of urea excretion; comparison of blood urea clearance with certain other measures of renal function. J. Clin. Invest., 1930, 8: 357–374.
337. Vermooten, V. New etiology for certain types of dilated ureters in children. J. Urol., Balt., 1939, 41: 455–463.
338. Vermooten, V., and Berry, R. V. Efficacy of methenamine as a bactericidal agent in urinary tract infections. N. England J. M., 1933, 209: 1332–1337.
339. Vesey, J., Dotter, C. T., and Steinberg, I. Nephrography: simplified technic. Radiology, 1950, 55: 827–833.
340. Vest, S. A. Conservative surgery in certain benign tumors of the ureter, J. Urol., Balt., 1945, 53: 97–121.
341. Idem. New inspection lens-sheath as an aid to transurethral resection. J. Urol., Balt., 1945, 53: 347–353.
342. Idem. Infections and diseases of the scrotum and its contents. In Campbell, M.: Urology. Vol. 1, pp. 666–732. Philadelphia and London: W. B. Saunders Co., 1954.
343. Völker and von Lichtenberg, A. Pyelographie, Müench. med. Wschr., 1906, 53: 105. Cited by Brown, P., 1933.
344. Von Lackum, W. H. Focal infections. In Lewis, B.: History of Urology. Vol. 1, pp. 183–266. Baltimore: Williams & Wilkins Co., 1933.
345. Walker (1911). Cited by Young, H. H., 1941.
346. Wall, B., and Rose, D. K. Clinical intravenous nephrogram (preliminary report). J. Urol., Balt., 1951, 66: 305–314.
347. Walters, W. and Braasch, W. F. Nephrectomy and nephroureterectomy for malignant tumors of the kidney. Am. J. Surg., 1935, 28: 23–31.
348. Wang, S. L. A new bladder insufflator; its use in tuberculous cystitis. J. Urol., 1948, 59: 1149–1152.
349. Watson (1905). Cited by Corbus, 1933.
350. Weld (1918). Cited by Brown, P., 1933.
351. Weyrauch, H. M., Jr. Death from an embolism following perirenal insufflation. J. Am. M. Ass., 1940, 114: 652–653.
352. Wharton, L. R. Urology in the female. In Campbell, M.: Urology. Vol. 2, pp. 1385–1430. Philadelphia and London: W. B. Saunders Co., 1954.
353. Whiteside. Cited by Hunt, V. C., 1933.
354. Wildbolz (1913). Citation by Young, H. H., 1941.
355. Wilms (1899). Cited by Young, H. H., 1941.
356. Wilson. Cited by Young, H. H., 1941.
357. Wilson and McGrath. Cited by Young, H. H., 1941.
358. Womack, E. B., and Koch, F. C. Studies on extraction of testicular hormone from tissues and on its quantitative distribution therein. Endocrinology, 1932, 16: 267–272.
359. Idem. Testicular hormone content of human urine. Endocrinology, 1932, 16: 273–277.
360. Wood and Ethridge (1933). Cited by Young, H. H., 1941.
361. Young, H. H. A new combined electrocautery incisor for the Bottini operation for prostatic obstruction. Bull. Johns Hopkins Hosp., 1902, 13: 36–45.
362. Idem. A new procedure (Punch Operation) for small prostatic bars and contracture of the prostatic orifice. J. Am. M. Ass., 1913, 60: 253.
363. Idem. A critique of modern cystoscopes; presentation of instruments embodying new features. J. Urol., Balt., 1927, 17: 17–23.
364. Idem. Young's punch; improved lighting of, and diathermy to control bleeding following punch operation. J. Urol., Balt., 1931, 26: 485.
365. Idem. Presentation of a new double catheterizing cystoscope for adults and for infants. J. Urol., Balt., 1932, 27: 249–264.
366. Idem.[1] Fifty Years' progress in urology. Am. J. Surg., 1941, 51: 120–163.
367. Idem. Urology: Punch instrument and resectoscope. In Glasser, O.: Medical Physics. Pp. 1621–1628. Chicago: The Year Book Publishers, Inc., 1944.
368. Zerfas (1929). Cited by Young, H. H., 1941.

[1]No attempt has been made to list the significant contributions of Young; the most important ones are mentioned and discussed in his 1941 review.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

The Surgical Management of Parotid Tumors. Edward J. Tabah. *Canad. M. Ass. J.*, 1954, 71: 456.

Failure in the surgical management of parotid tumors continues to occur and the author attempts to analyze some of the reasons for this. They include the following: (a) lack of adequate knowledge of the surgical anatomy of the parotid region together with the incorrect surgical approach to the facial nerve; (b) lack of adequate preparation or assistance at the time of operation; and (c) failure to carry out a sufficiently wide removal of the tumor, or radical removal of the entire gland when indicated.

The surgical anatomy of the facial nerve and parotid gland is briefly reviewed, and the methods advocated in the literature for identifying the facial nerve are analyzed.

The author believes that the simplest and most effective method of managing benign parotid tumors consists in complete exposure of the parotid gland area and tumor by wide reflection of skin flaps, and immediate and direct exposure of the facial nerve, tracing its branches through the gland substance, preserving these branches, and removing all parotid tissue superficial to them.

The author lists his indications for total parotidectomy, viz., (1) benign mixed tumors arising from the deep portion of the gland; (2) all recurrent benign mixed tumors; (3) all malignant tumors, in cases in which the diagnosis is made preoperatively or at the time of operation.

The author believes that radical neck dissection should be reserved for those primary malignant tumors in which cervical lymph node metastases develop, or in which there is local recurrence of a malignant tumor. The main complications of parotidectomy are recurrence, injury to the facial nerve, the Frey syndrome, a salivary fistula, and loss of sensation about the ear.—*Ely Elliott Lazarus, M.D.*

EYE

Terramycin in Trachoma. Gjorgje Pavkovic-Bugarski and Milica Cvetojevic. *Brit. J. Ophth.*, 1954, 38: 692.

Research on the effectiveness of terramycin was carried out in Yugoslavia.

Eighty patients with trachoma in three stages of the disease, all previously untreated and in active stages, were observed. One-half, or 40 of these patients, were given terramycin locally and the other half were given sulfonamides orally in addition to terramycin locally.

The results were good. Thirty-seven patients were clinically cured; however, in a few cases mild pathologic changes remained even after 3 months of treatment. The remaining 43 patients were improved.

The combination of sulfonamides orally and terramycin locally was superior to local treatment only.

Microbiologic and biomicroscopic, as well as histopathologic observations were described. Trachoma bodies were destroyed by the treatment; however, the authors emphasize that while terramycin is not a specific for this disease, it is a useful drug.

—*Albert C. Frell, M.D.*

Erythromycin in Trachoma. L. P. Agarwal and R. P. Saxena. *Brit. J. Ophth.*, 1954, 38: 690.

The authors, working in Agra, India, carried out a controlled treatment of 100 patients with trachoma. The dosage was 100 mgm. every 4 hours for a period of 1 week and 5 mgm/gm. of ointment locally two to three times a day. The controls were given normal saline.

The results revealed the presence of inclusion bodies in untreated (control) cases and the subjective symptoms did not improve. In the treated cases, symptoms improved within 24 hours, and in 50% of cases, pannus retrogressed and inclusion bodies disappeared.

Toxic effects were rare, 3 cases reacting to the ointments. One case developed dermatitis and another had mild diarrhea.

The conclusion was that erythromycin is a valuable and effective drug in many cases of trachoma.

—*Albert C. Frell, M.D.*

Strabismus Surgery—Monocular or Binocular? Frank D. Costenbader. *Arch. Ophth.*, Chic., 1954, 52: 655.

The goal of treatment for strabismus is to attain binocular vision in all fields of gaze. Failure to attain this goal may be due to numerous factors, one of which may be asymmetrical surgery on the ocular muscles.

In a total of 665 patients examined and operated upon by the author, there was comitance in all fields preoperatively, with use of a range of 10 prisms or less

in lateral fields as comitant. Fixation was disregarded in the choice of surgery.

Of the patients with esotropia who underwent symmetrical surgery (bilateral recession of medial recti, bilateral resection of lateral recti, or bilateral marginal tenotomy) after 18 months, 90 per cent showed comitance.

Of the patients who had two stages of surgery, the second stage completing the "symmetrical" procedure, 82 per cent were comitant.

Of those having monocular or asymmetrical surgery, 48 per cent were comitant. Of those having only a unilateral recession, 50 per cent were comitant; of those having resection and recession, 39 per cent were comitant, and of those having only a unilateral resection, none was comitant.

Fixation depends on visual acuity, amblyopia, ocular dominance, and not on muscle weakness, so patients in this series were advised to have binocular surgery if the degree of squint was large enough. Monocular surgery was done on monocular fixators, with 50 per cent maintaining comitance, while in alternators, 47 per cent maintained comitance. When bilateral surgery was done on monocular fixators, 97 per cent attained comitance, and on alternators, 97 per cent also attained comitance.

Additional factors were noted, such as a greater degree and number of proptosis or exophthalmos, and deviations in palpebral aperture were noted after asymmetrical operations.

Major conclusions were: (1) comitance is attained more often with symmetrical surgery; (2) fixation does not influence comitance in symmetrical surgery; (3) monocular surgery results in permanent incomitance in over 50 per cent of cases; (4) two-stage symmetrical surgery often results in comitance.

This excellent article presents valuable information and data for thought in the management of the surgery for squint. —*Albert C. Frell, M.D.*

Plasmocytoma of the Orbit. VERNON K. S. JIM. *Am. J. Ophth.*, 1955, 39: 43.

A PLASMOCYTOMA, or plasmoma, is a neoplasm consisting essentially of plasma cells. Its occurrence within the orbit is relatively unusual. The diagnosis of plasmocytoma is based largely upon the histologic study of the tumor tissue. Because of the paucity of reports concerning orbital involvement by this type of tumor, the author presented the case of a 60-year-old white woman with an orbital plasmocytoma causing clinical signs and symptoms of an orbital neoplasm. The tumor was successfully treated by surgery and x-ray therapy.

In cases of extensive involvement of vital orbital tissues along with bony erosive changes, subtotal removal combined with intensive x-ray therapy may produce good therapeutic and clinical results.

A Technique of Corneal Grafting Developed in New Zealand. C. A. PITTAR. *Am. J. Ophth.*, 1954, 38: 689.

PITTAR CUTS the graft by the Swiss method; the excised cornea is placed, epithelial surface down, on a hard paraffin block, and the graft is pressed out with the trephine without rotation. The disc of the recipient cornea is removed with a special punch designed by the author. The technique of manufacturing the punch is described in detail. The disc is outlined with the trephine; a horizontal section across its center is made with a Graefe knife, and then each half of the disc is punched out with the punch. The graft is held in place by a tantalum splint. Having tried border-to-border sutures for fixing the graft in position, Pittar concludes that the results are better in the cases in which splints are used and the technique with the splint is much easier.

Two cases of corneal opacities caused by interstitial keratitis, in which this technique was used, are reported and the results are illustrated.

—*Ray Karchmer Daily, M.D.*

Oxyphenonium (Antrenyl); a Substitute for Atropine; a Clinical Study. IRA A. ABRAHAMSON, JR., and PAUL HURWITZ. *Arch. Ophth.*, Chic., 1954, 52: 519.

ANTRENYL (CIBA) is a powerful anticholinergic drug of neutral reaction in aqueous solution. A buffered 5 per cent solution, though tolerated, burns and may cause some conjunctival secretion. Instillation in the eye of one drop of this strength is more powerful than atropine, 1 per cent, causing a maximal mydriasis in 37 to 80 minutes which persists for 10 to 21 days, and a cycloplegia, complete in 40 to 90 minutes, which continues for 7 to 17 days. Neither the mydriasis nor the cycloplegia thus induced can be counteracted by pilocarpine, physostigmine, carbachol, or di-isopropyl fluorophosphate. The drug has been used successfully in patients with atropine sensitivity and no allergic reactions to antrenyl have been encountered.

—*James E. Lebensohn, M.D.*

NOSE AND SINUSES

The Surgical Treatment of Cancer of the Nose, with Emphasis on Methods of Repair. WILLIAM F. MACFEE. *Ann. Surg.*, 1954, 140: 475.

THE NOSE is one of the common sites of cancer of the face, of cutaneous origin, in all probability because of its physical projection and greater exposure to sunlight and weather. Another contributing cause has been the injudicious therapeutic use of irradiation in the treatment of skin disorders.

The great majority of carcinomas affecting the skin of the nose are the basal celled variety, but there is a certain incidence of squamous celled carcinoma as well.

The early symptoms are almost negligible. The diagnosis is not difficult because the lesions are plainly visible and palpable, grow in a characteristic manner, and are easily biopsied.

Both in basal celled carcinoma and squamous celled carcinoma remote dissemination is uncommon, and metastasis is not ordinarily an important problem.

For many years, the treatment of carcinoma of the nose has been mostly by radiologic or dermatologic methods, as the surgeons have been reluctant to create obvious and unsightly scars on the face; however, due to recent progress there has been a revival of interest in surgical treatment, which is still the most reliable method of treatment of accessible cancer.

Defects caused by the removal of early cancer of the nose can usually be obliterated by the use of free full thickness skin grafts, or composite grafts made up of skin and cartilage taken from the ear.

1. Skin grafts taken from the ear or from the neck above the clavicle retain their normal color permanently, and there is little or no contrast with the surrounding skin of the nose.

2. Defects resulting from the removal of advanced cancer, including those which require complete removal of the nose, usually can be repaired by means of pedicled grafts derived preferably from the forehead.

3. The complete restoration of the nose is greatly simplified by the implantation of cartilage or bone to serve as a framework for the new nose and the application of a free graft of skin to the raw under surface to serve as a substitute for nasal mucous membrane while the new nose is still on the forehead.

4. Transfer of the prefabricated nose to the nasal defect is facilitated by a long pedicle of the kind employed in a sickle type of flap.

5. The use of forehead flaps inevitably results in some scarring of the forehead, but the advantages of the forehead graft greatly outweigh its drawbacks.

6. Cancer of the external nose, whether of squamous or basal celled type, metastasizes infrequently, and complete local removal gives a high rate of cure.

7. With the excellent means of repair now available the obligation to remove malignant tumors completely at the first operation is greater, even at the sacrifice of a considerable part or all of the nose.

The author then gives a historical discussion of plastic surgical repair of the nose.

The restoration of total and subtotal defects of the nose is the oldest major reconstructive operation of which there is a record. It was first developed in India. The earliest recording of nasal restoration was in 1,000 B.C. —*John R. Lindsay, M.D.*

Malignant Tumors of the Nasopharynx; Transpalatine Surgical Excision. H. JAMES HARA. *Arch. Otolar.*, Chic., 1954, 60: 440.

THE AUTHOR reviews 16 cases of malignant tumors of the nasopharynx observed from 1948 to 1953 at the Los Angeles County General Hospital, and 17 cases of malignant tumors observed at White Memorial Hospital, in Los Angeles. There were 15 squamous cell carcinomas, 7 anaplastic carcinomas, 6 lymphepitheliomas, 2 mixed salivary gland tumors, 2 lymphomas, and 1 plasmocytoma. The patients were 24 Caucasians, 5 Chinese, 2 Japanese, 1 Filipino, and 1 negro.

The histopathology of the nasopharynx is reviewed.

The earliest symptoms of nasopharyngeal tumor were: vague throat irritation, alteration of vocal resonance, intermittent tubal obstruction, abnormal postnasal discharge, and occasional epistaxis. Later symptoms and findings were: cervical metastasis, nasal symptoms, visual disturbance, headache, and aural manifestations.

Diagnosis is made by means of posterior rhinoscopy with the mirror, Yankauer's nasopharyngoscope, or an electric nasopharyngoscope, and it is confirmed by biopsy.

Irradiation is the treatment of choice for both sarcomatous and carcinomatous growths. Malignant growths in this area are highly radiosensitive, but unfortunately this does not imply radiocurability in every instance.

Experience has shown that certain tumors in this area are best treated by surgical removal, preceded, followed, or both preceded and followed by irradiation. Among these tumors are benign angiofibromas, fibrosarcomas, adenocarcinomas, and sometimes well localized lymphomas.

The technique adopted by the author for removing nasopharyngeal tumors is:

The patient is placed on his back. Intratracheal anesthesia is administered, and the hypopharynx is snugly packed with a strip of gauze. A Davis mouth gag is introduced. A horseshoe-shaped incision is made down to the bone, beginning 1 cm. medial to the last molar tooth on the left, then swept along the dental arch forward, just back of foramina of Scarpa, around to the right third molar. This incision goes as far back as the posterior palatine foramen but does not include the palatine vessels on either side. With a heavy periosteal elevator the soft tissue over the hard palate and palatine bone is lifted out of its attachment. When the posterior border of the palate bone is reached, a curved dissector is used to elevate the nasal mucosa from the floor of the nose. The amount of the palate bone and of the vomer to be sacrificed depends upon the operative indication. This part of the operation is done with Hajek's biting rongeur. A soft rubber catheter is introduced into each nostril and delivered through the mouth. When gentle traction is applied on the catheters, one obtains an adequate view of the operative field. The tumor is dissected and then snared. The stump of the growth may be cauterized by diathermy current. With such an approach the operator obtains perfect hemostasis. There is no area in this cavity which cannot be explored under direct vision. Through this same approach the sphenoid sinus above and the choanal orifices anteriorly can be readily reached. When the growth is completely removed, traction on the catheter tubes may be released. The palatine flap is gently replaced and sutured. The wound heals in 3 to 4 days.

The outlook for the management of malignant tumors of the nasopharynx is not too dark. The earlier the diagnosis, the better the final outcome will be. —*John R. Lindsay, M.D.*

MOUTH

The Primary Repair of Clefts of the Palate. WILFRED HYNES. *Brit. J. Plast. Surg.*, 1954, 7: 242.

THE OBJECT of this article is to encourage a more critical approach to the cleft palate problem and particularly to the value of procedures which are now widely practiced. The author presents an interesting approach of his own. He concludes that 30 to 40 per cent of patients with cleft palate speak imperfectly as the result of inadequate palatopharyngeal closure following standard primary cleft palate operations. The V-Y operation for repair of cleft palate has been practiced for a period of over 25 years. Some of the

unsatisfactory features of the V-Y palate operation are presented and the author describes a primary cleft palate repair which is designed to avoid them.

The V-Y operation aims at both closure and elongation of the palate. Though this operation can deal with the narrower clefts which are bordered by substantial palatal elements, its use in the treatment of the wider clefts can be most disappointing. The small, ill-developed palatal elements associated with wide clefts do not possess enough tissue to provide both for closure and elongation of the palate and a V-Y operation results in a velum which, though perhaps in one piece, is too short to effect palato-pharyngeal closure during speech.

The author suggests that, if a sufficiently effective pharyngoplasty is first done, the posterior and lateral walls of the pharynx can be advanced to such an extent that the V-Y advancement operation is no longer necessary; its place can be taken by a much simpler palate repair in which the soft tissues of the palatal elements are used merely to close the cleft from side to side without making any attempt to lengthen the velum at the same time. In this way the surgical damage inflicted on the palate is minimized and a velum is produced which, though short by ordinary standards, possesses a high degree of movement.

Pharyngoplasty by muscle transplantation consists of a mucomuscular flap based upwards. This is raised on each lateral pharyngeal wall, the upper end of each flap lying at the level of the lower border of the adenoid pad (or just below the level of the Eustachian cushions in older patients in whom the adenoid pad has atrophied). Each flap consists of the whole thickness and width of the lateral pharyngeal wall, i.e., it has the mucosa of the lateral pharyngeal wall on its superficial surface, and the subjacent lateral pharyngeal muscles (the salpingopharyngeus, the palatopharyngeus, and the underlying superior constrictor) on its deep surface. The two flaps are then transposed upwards and inwards until they lie with their deep muscle surfaces in a transverse mucosal defect created across the posterior pharyngeal wall at the lower level of the adenoid pad (or just below the level of the Eustachian cushions in older patients). In this way a prominent contractile posterior pharyngeal ridge is produced, and considerable narrowing of the transverse diameter of the pharynx follows closure of the secondary defects on the lateral walls of the pharynx which result from the raising of the two mucomuscular flaps. The palate is then closed by a modification of the V-Y procedure by freshening and suturing in two layers. The step-by-step details are given in the original article.

The combined operations have been done on babies 12 to 15 months of age, although the author is inclined to wait until the patient is 18 months old.

It will obviously take a number of years before the real value of this operation can be assessed, and no attempt can therefore be made at the present time to analyze its results in the 30 patients already treated.

—*Frank W. Pirruccello, M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Cerebrospinal Fluid Rhinorrhea in Closed Head Injuries. WALPOLE LEWIN. *Brit. J. Surg.*, 1954, 42: 1.

IN THIS excellent study, the author discusses the management and late results of treatment in 84 cases of cerebrospinal fluid rhinorrhea following closed head injury. The patients were seen between the years 1939 and 1946 at the Military Hospital for Head Injuries and the Nuffield Department of Surgery, Oxford. The incidence of paranasal sinus fractures in an unselected series of closed head injuries was 7.2 per cent, and of cerebrospinal fluid rhinorrhea, 2 per cent.

The identification of the discharge of cerebrospinal fluid through the nose is usually easy when associated with a history of head trauma and radiologic evidence of fractures involving the frontal, the ethmoidal, or the sphenoidal sinuses. The cerebrospinal fluid rhinorrhea is usually unilateral. If necessary the fluid's sugar, protein, and chloride contents can be determined. It is rarely confused with drainage occurring from vasomotor or allergic rhinitis which is usually associated with sneezing, lacrimation, or photophobia. Intrathecal tracer substances may also be used to clear up any diagnostic difficulties. Among these 84 cases, the onset of cerebrospinal fluid rhinorrhea occurred within 48 hours after the accident in 50 patients and within 3 months in the remainder. Delayed onset is often more apparent than real and may result from changes in intracranial pressure, the absorption of clot and necrotic brain tissue, and the subsidence of local edema. The fluid drainage stopped spontaneously during the first week in 33 cases, between the first and the fourth week in 15 cases, and later in 5.

A unilateral rhinorrhea usually indicates accurately the side of the dural tear. Of 17 cases of bilateral rhinorrhea, a bilateral exploration was performed in 14 and dural tears were found on both sides in 9, and on one side in 4; exploration was negative in 1 case. The bilateral drainage seemed to be associated with fractures of the bony septum between air-sinuses. It may be concluded that if fracture and rhinorrhea are on the same side, the dural tear will be found limited to that side also. Aeroceles, either subdural, subarachnoid, ventricular or intracerebral, are frequently associated with cerebrospinal fluid rhinorrhea. Occasionally, in relation with fractures of the lateral ethmoidal cells, cerebrospinal fluid may drain into the orbital tissues and form a fluctuant mass above and medial to the globe.

The most common associated symptom is anosmia which was found in 78% of the reported cases. Anosmia suggests damage to the ethmoidal region, but preservation of the sense of smell in conjunction with a fracture in the paranasal sinus region and cerebrospinal fluid rhinorrhea implies that the dural tear is in relation to the frontal sinus or the sphenoidal sinus. Severe headaches were present in 15 per cent of the cases.

The dural tear may vary considerably and thus not need to be larger than a few millimeters in diameter to produce spinal fluid rhinorrhea. The extent of the underlying damage to the frontal lobes and its relationship to the dural tear also varies considerably. Following spontaneous stop of the rhinorrhea, only rare instances of complete healing of the linear dural tear were found at operation. More often, brain fungus was found filling a large bony defect into the air-sinuses and preventing escape of cerebrospinal fluid, or obliteration of the subarachnoid spaces adjacent to the fracture line, or adherence of the sinus mucosa which had grown across the fracture line to the dural margins of the brain tissue. By none of these natural ways can the repair be considered effective as long as no fibrous barrier is present which will prevent ingress of infection from the nose. Spontaneous cessation of rhinorrhea occurred within 48 hours in 13 patients, and within 3 days in 3. Of these, 8 were subjected to a dural repair operation. In all, obvious tears and free communication with the air-sinuses were found. Following repair, no subsequent rhinorrhea or infectious complications arose. By contrast, among the other 8 patients treated conservatively, a cerebral abscess developed in 1 patient, and a fatal pneumococcal meningitis developed in another 18 months after the accident. The author emphasizes that there is no justification for the assumption that the mild rhinorrhea of early onset and brief duration implies effective healing of the tear. While natural repair is sometimes effective, delayed complications are common.

Associated with the cerebrospinal fluid rhinorrhea, skull fractures were found in the lateral frontal region in 40, in the central region in 30, in the orbital region in 6, in the facial region in 5, and no fractures were found in 3. The author suggests that radiologic study of the paranasal sinus fractures be done several days after the injury when the blood in the sinuses will have cleared and the fracture line will have become more obvious. The 3 cases in which no fracture could be demonstrated revealed the presence of a small tear leading to the ethmoid sinus in 1 case, torn olfactory filaments displaced from their entrance at the cribriform foramina in 1, and no obvious pathology in 1.

Operative repair of the defect was advised in the majority of the patients as a prophylactic measure. Of the 26 patients not operated upon, 6 developed meningitis within the follow-up period, of whom 4 died. Of the 84 patients with a cerebrospinal fluid rhinorrhea, 16 developed meningitis at some stage, of whom 6 died. The majority of the infections was caused by pneumococci and only a few by Staphylococcus albus or streptococci. In 73 per cent of the cases, infection occurred within 3 months of the accident. The precipitating factors in the development of infection were upper respiratory tract infections, infected wounds, manipulation of facial fractures, nasal examinations, and lumbar punctures.

The treatment consists of sulfonamide and penicillin prophylaxis followed by operation. Dural repair was

performed in 56 cases, and in 51 of these dural tear was found. Most cases required a fascial graft obtained either from the temporal muscle fascia or from the fascia lata. The graft was usually placed between the dura and bone so as to cover the whole paranasal sinus area. Postoperative complications included infections in 3 cases, recurrences of the cerebrospinal fluid rhinorrhea in 3, chest complications in 3, epilepsy in 3 cases, and extradural hemorrhage in 1 case.

Definite dural repair is not advisable until the patient has recovered from the immediate effects of his injury, and prophylactic measures should be taken against infection during the waiting period.

In conclusion the author states that dural repair should be considered in all cases of paranasal sinus fracture with cerebrospinal fluid rhinorrhea whether the rhinorrhea is of early or late onset, or of brief or long duration. The risk of intracranial infection supervening unless dural repair is performed is considered to be at least 25 per cent. —*George Perret, M.D.*

SYMPATHETIC NERVES

Reoperation on the Lumbar Sympathetic Chain (Ueber Reoperationen am lumbalen Grenzstrang). R. Gottlob. *Chirurg*, 1954, 25: 450.

During the period from 1947 to 1954, reoperation on the lumbar sympathetic chain was done 19 times in 18 patients. The results of these reoperations are reported and the indications for reoperation are discussed. Only reoperations done on the same side as the original operation are included in this report, except for one patient with sclerosis who underwent bilateral reoperation. The grade of the vascular disease is considered and results of reoperation are classified on a basis of very good, good, and unsatisfactory. For purposes of objective evaluation of a good result, sweating tests or skin temperature measurements were carried out in all cases.

There were 4 cases of thromboangiitis obliterans, 12 cases of peripheral sclerosis, and 2 cases of phantom pain. Among 19 reoperations, the results were very good in 6, good in 5, and unsatisfactory in 8 cases. A comparison of results was made on the basis of the site of arterial obliteration. With involvement of the pelvic arteries, the obliteration was considered central (7 cases), and with involvement of the leg arteries, peripheral (10 cases). There were 4 "very good" results following reoperation for peripheral obliteration but no "very good" results following reoperation for central obliteration.

The primary causes for the unsatisfactory result following the original operation were: sympathectomy carried out at too low a level (10 cases), and failure to find the chain (4 cases). Only when the first lumbar ganglion is removed can one expect elimination of sweating over the whole leg. At reoperation, as well as in all lumbar sympathectomies, the author carries out section at as high a level as possible with exeresis of a thoracic portion through a slit in the diaphragm. Occasionally he resects the twelfth rib. In the event that the sympathetic chain could not be found he has applied phenol to the retroperitoneal space with an occasional good result.

The causes for the failure of reoperation were the impossibility of finding the sympathetic chain in 5 cases, and in 3 cases failure was due to the severity of the vascular disease or to paradoxical gangrene.

Reoperation on the lumbar sympathetic chain may be considered when sweating tests or electrical skin resistance tests show that the chain has not been completely removed in the region of L 1 to L 3. An incomplete first operation is indicated when sweating is absent only to the lower thigh with normal sweating over the upper thigh. A prerequisite for a good result following reoperation is a not too severely diseased arterial bed. With advanced diseases, especially with extensive necrosis, reoperation offers little promise. For patients with thrombosis of the pelvic arteries, the prognosis is less favorable following reoperation than for those with involvement of the leg arteries.

—*John L. Lindquist, M.D.*

MISCELLANEOUS

Twenty Years' Experience with the Surgery of Hypertension. Edgar A. Kahn. *N. England J. M.*, 1954, 251: 633.

In a review of 20 years' experience with surgery of the sympathetic nervous system for the treatment of hypertension, Kahn lists three reasons for the waning popularity of this type of therapy. The most important is that significant reduction in blood pressure is obtained in less than 50 per cent of the patients operated upon. In addition, the long and painful convalescence and the recent increase in the use of hypotensive drugs are also given as explanations. Kahn, however, feels that these reasons are illogical in the light of present knowledge.

Careful selection of patients for surgery, especially excluding those with nitrogen retention and at the same time accepting those with markedly elevated pressures without fear of the postoperative drop, is important. The author points out, however, that unfortunately there are as yet no criteria that have been found that make a surgeon confident a given patient will respond favorably to operation.

Basing this report on 268 operations carried out between 1946 and 1949, with the dissection being carried from the twelfth dorsal to above the sixth dorsal segment as a one-stage procedure, the mortality in this high bilateral resection was 3 per cent. Comparing his results with those of other authors using somewhat differing procedures, the author feels that the splanchnic operation developed by himself and Peet measures up well. He points out that the choice of procedure depends on the one with which the surgeon is most familiar, and he regrets that operations that have been proved to relieve headache and improve life expectancy in severely ill patients have not been accepted by the majority of practicing physicians.

—*Joseph Ransohoff, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Tumor Heredity in Tumor of the Breast (Il problema dell'ereditarieta' neoplastica nell'uomo; il cancro della mammella). PIETRO BUCALOSSI, UMBERTO VERONESI, and ANNA PANDOLFI. *Tumori*, Milano, 1954, 40: 365.

THE AUTHORS present a thorough and painstaking statistical study on tumor heredity, which was carried out on 230 patients with mammary carcinoma (probands), and compared with a similar study on 230 controls. The study was performed at the Institute for the Study and Cure of Tumors, in Milan, Italy.

A brief historical background dealing with this subject is reviewed, dating back to Velpeau, in 1854, who cites an instance of 2 sisters who were stricken with carcinoma of the breast at the age of 35, and whose mother died of mammary carcinoma. Wainwright (1931), in America, noted that in 784 cases of mammary cancer, 11.4 per cent of the parents died of malignant neoplasms, whereas in 576 control cases only 8.5 per cent of the parents died of malignant disease.

This study was carried out from October 1951 to December 1952. Only cases of proven mammary carcinoma, whose genealogy and associated medical background could be studied and known, without equivocation, were selected. Studied in the genealogy were the grandparents, parents, aunts and uncles, brothers and sisters, and descendants of the probands. Also, healthy controls of similar genealogical background and numbers were carefully selected, keeping in mind the following criteria: comparison with similar age groups, selection from similar geographical provinces, and consideration and comparison only between similar types of relatives. Pearson's Formula of X_2 and Fischer's P (probability) values derived from the statistical methods set forth in "The Statistical Methods for Research Workers" are applied to the statistics obtained and analyzed.

Within the family of the probands it was determined that the incidence of malignancies in general was twice as common as in the families of the controls and, in particular, that cancer of the breast was three times as frequent in the proband families as in the control families. Of 3,236 proband relatives studied, there were 220 with malignancies (6.79%) in general, and 37 with mammary cancer; of 3,250 control relatives, only 109 (3.35%) had a malignancy and only 11 had cancer of the breast. The application of Pearson's Formula (X_2) shows this figure to be significant and not one of pure happenstance.

Interestingly enough, the proband group had involvement of the left breast more frequently than the right breast and, conversely, the control group had the greatest incidence of involvement in the right breast.

When bilateral mammary cancer occurred in the probands, the incidence of malignancy in their relatives under scrutiny was greatly elevated.

The authors also learned from their study that the age onset of mammary cancer in the proband group is significantly lower than the average age onset of malignancy in their relatives; furthermore, that within the proband group the occurrence of mammary cancer tends to appear at an earlier age with each successive generation; i.e., the average age incidence of mammary carcinoma in the parents was 57.4 years, while that of the daughter with mammary carcinoma was 50.9 years, a difference of 6.5 years. On the other hand, the average age of the maternal aunt with mammary carcinoma was 58.5 years and the average age of the nieces similarly affected was 45.1 years, a difference of 13.4 years.

The milk factor therapy for the transmissibility of mammary cancer was also scrutinized by these workers and they concluded that their statistics could neither support nor justify this hypothesis.

—*Frank O. Franco, M.D.*

Results of Treatment of 1,569 Carcinomas of the Breast in the Göttingen Clinic During the Period 1940–1953 (Behandlungsergebnisse der Goettinger Klinik von 1,569 Mammacarcinomen von 1940–1953). K. HINRICHS. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 279: 121.

AMONG 1,569 patients with cancer of the breast, 1,524 were women and 45 were men. The right breast was involved in 45 per cent and the left breast in 47 per cent, while both sides were affected in 8 per cent of the entire series.

Follow-up studies were made on 1,532 patients; the remaining 37 were considered dead. Furthermore, patients belonging to one of the following groups were counted as fatal cases: (1) those who expired within 7 years after the treatment and whose death certificates indicated metastases; (2) those in whom metastases were found at any time after treatment in the Göttingen Clinic, and whose fate could not be traced; (3) untreated patients who could not be followed up; and (4) postoperative fatalities.

According to Steinthal's classification, 21 per cent of the entire material belonged to group I, 51 per cent to group II, and 28 per cent to group III. According to the literature, the discrepancy between the clinical and the histologic basis for this classification ranges from 28 to 67 per cent.

An exact histologic diagnosis could be established in 1,103 patients. Scirrhous cancer was found in 29.8 per cent, medullary cancer in 14.2 per cent, solid carcinoma in 7.1 per cent, Paget's disease in 3.9 per cent, and adenomatous cancer in 3.6 per cent of the entire group. The greatest number of 5 year survivals was registered in patients with Paget's disease. Of 431 patients belonging to Steinthal's group II, 269 (62.2 per cent) were alive 5 years after the operation, but in only 40.3 per cent of those alive were no recurrences or metastases present.

In the last few years the following routine has been followed: for cancers in stage I, operation followed by irradiation; in stage II, preoperative irradiation, breast amputation, postoperative irradiation, and re-

moval of ovaries; in stage III, either operation or irradiation.

The author ascribes the relatively better results in the last few years to the following factors: (1) reduced postoperative mortality, (2) uniformity of indications, (3) very radical operation, (4) exclusion of ovaries in stage II, (5) intensive preoperative and postoperative irradiation combined with hormone therapy.

—*Joseph K. Narat, M.D.*

TRACHEA, LUNGS, AND PLEURA

A Clinical Survey of Adenomas of the Trachea and Bronchus in a General Hospital. LAMAR SOUTTER, RONALD C. SNIFFEN, and LAURENCE L. ROBBINS. *J. Thorac. Surg.*, 1954, 28: 412.

IT HAS BEEN A PRACTICE, in error, to group together and treat alike all endobronchial tumors that are not bronchogenic carcinoma. The class of tumors commonly called adenoma includes two distinct histologic and clinical varieties: carcinoid adenomas and cylindromas. The report deals with 56 of the former and 4 of the latter observed during 45 years at the Massachusetts General Hospital, Boston.

Carcinoid adenomas are masses of uniform small polygonal cells arranged in columns, or occasionally as acini, intimately associated with vascular and lymphatic sinusoids. Evidences of malignant activity are mitoses, penetration of the capsule into the adjacent lung, and metastases to nearby lymphnodes. The grossly well circumscribed tumors tend to grow mostly outside of the bronchial wall, with variable amounts of intramural growth and intrabronchial protrusion. Only 11 of the tumors were entirely within the bronchus, 5 being pedunculated. Pulmonary suppurative changes reflected the degrees of bronchial obstruction caused by the tumors.

Cylindromas are relatively avascular masses of tubular and acinar groups which may secrete mucin. They grow without capsular enclosure when they penetrate the trachea or major bronchi, in which they arise, and invade adjacent structures. They may present polypoid intraluminal masses. In 3 patients the cylindroma originated in the trachea. In 1 of these the tumor was pedunculated but invaded the wall of the trachea and no capsule had formed; in another the tumor invaded the wall of the trachea almost in its entirety, extending into the thyroid gland but producing no mucosal ulceration; the third tumor invaded the thyroid with fingerlike projections. In a fourth patient the cylindroma originated in the right intermediate bronchus and had spread to the lobar bronchi. Thirteen years after a pneumonectomy the patient died with tumor involving the trachea, pericardium, and left auricle as well as the stump of the right bronchus. The clinical behavior of the cylindromas as well as their ability to invade perineural lymphatics, belie their benign histologic appearance.

Both the carcinoid adenomas and the cylindromas were nearly equally divided between males and females. The average age at the onset of symptoms attributed to the carcinoid adenomas was 33 years, while the ages of the patients with cylindroma were 35, 36, 63, and 65 years, respectively. The average delay between the onset of symptoms and establishment of the diagnosis was 4.1 years, and between the diagnosis and surgical treatment was 2.6 years.

The symptoms are referable to an endobronchial mass with impairment of the airway and bleeding, to pulmonary infection, and to general body reactions to pulmonary suppuration and collapse.

Roentgenographic techniques demonstrated the tumors in about one-half of the cases and pulmonary changes due to bronchial obstruction in the other half. Some collapse was seen in about three-fourths of the cases. Bronchiectasis was easily seen in many cases without bronchography. Few cases were examined early enough to demonstrate obstructive emphysema. High KV techniques, laminographs, and fluoroscopic spot films were important in some cases.

Thirty-five carcinoid adenomas and 2 cylindromas were found by biopsy through the bronchoscope before resection. Bronchoscopic biopsy was done in 9 other cases; in 11 cases the diagnosis was made by surgical biopsy and in 3 at autopsy.

Although a few patients were treated by x-irradiation or by radon seed implantation, the evaluation of that therapy was inadequate. Because the diseased lung beyond the tumor is not benefited by such treatment, irradiation seems not to be the treatment of choice.

Operative treatment was carried out in 47 cases, of which 2 were cylindromas. Primary bronchoscopic removal and radon seed application was successful in 1 case. Sixteen patients had pneumonectomies, 14 had single lobectomies, 12 required removal of 2 lobes, and 2 had segmental lung resections. One cylindroma was excised by trachectomy. One tumor was removed by transthoracic bronchotomy.

The follow-up is complete. Forty-one of 56 patients with carcinoid tumors are alive; 73.3 per cent of the patients seen more than 5 years ago have survived at least 5 years, in contrast with a 4.1 per cent survival for patients with bronchogenic carcinoma. Two of 3 patients with cylindroma survived 5 years. In only 1 of the 15 patients with carcinoid adenomas who died, was a metastases (lymphnode) found.

Eleven patients with carcinoid adenomas which were diagnosed but not treated survived up to 21 years (an average of 3.1 after diagnosis). The cylindromas presented a more malignant character.

Two patients died, 1 was untreated (asphyxiation) and the other had widespread metastases 13 years after pneumonectomy. One untreated patient remains alive 5½ years after biopsy diagnosis. The fourth patient remains well 5 years after partial resection of the trachea.

—*Leonard D. Rosenman, M.D.*

Pulmonary Resection in Childhood Tuberculosis. GLADYS L. BOYD and F. R. WILKINSON. *Dis. Chest*, 1954, 26: 442.

USUALLY EXCISION of tuberculous lesions in childhood is only indicated when endobronchial disease results in collapse and fibrosis of the lobe involved, or in bronchiectasis. Occasionally thoracotomy may be necessary for diagnosis.

Two hundred and fifty pulmonary resections in children were done at the Hospital for Sick Children, in Toronto, during a 25 year period. Eighty per cent of these were for tuberculous disease and less than 10 per

cent were necessitated by the presence of foreign bodies. The first two resections for tuberculosis were done in 1930 and 1931.

There are two types of endobronchial tuberculosis which develop in childhood: a bronchiectatic type and a primary bronchial type. The first type presents a bronchoscopic picture of granulations and caseation, which was present in all the cases of lower lobe involvement in this series, and in occasional cases of upper lobe involvement. The second type presents a less dramatic picture through the bronchoscope; at first there is redness and swelling and later there is ulceration, fibrosis, and stricture.

The association of congenital anomalies with tuberculous bronchiectasis occurred in 5 of these patients.

Usually, tuberculous bronchitis was treated by bronchial suction and streptomycin or para-aminosalicylic acid, or both, before surgery was considered. However, this treatment was frequently ineffective. The combination of suction and isoniazid appears more promising.

Children showing improvement on nonoperative management are not operated upon. Otherwise the indications for resection are as follows:

1. Persistent positive sputa from the involved area after a course of treatment.
2. Persistent cough or localized "wheezing."
3. Bronchoscopic evidence that ulcers are not healing and the disease progressing.
4. Bronchographic evidence of bronchial irregularity, constriction, or bronchiectasis that shows no sign of regressing.
5. Persistent constrictive collapse of a lobe.
6. Added purulent infection in the bronchiectatic area.
7. Radiographic evidence of massive lower lobe involvement.
8. The presence of an associated congenital lesion.
9. Pneumonic episodes involving the diseased area.
10. Recurrence of positive sputum not accounted for by other lesions.
11. Failure to reverse the ectasia.
12. Secondary non specific bronchiectasis.
13. Poor general health indicating a secret focus of infection.

Contraindications to operation include extensive bilateral disease.

The results in this series have been excellent. Children tolerate lobectomy and pneumonectomy well. The younger they are, the better they are immediately after operation; their functional recovery is good.

—Frederick W. Preston, M.D.

Carcinoma of the Lung; a Report of 403 Cases. David P. Boyd, Magnus I. Smedal, Howard B. Kirtland, Jr., Gurney E. Kelley, and John G. Trump. *J. Thorac. Surg.*, 1954, 28: 392.

The authors analyze 403 cases of carcinoma of the lung which were seen at the Lahey Clinic, Boston, during the 15 years preceding 1952. There were 6.6 times as many male patients as female; 82.6 per cent of the patients smoked tobacco. The types and the severity of symptoms are tabulated. Diagnoses were made by interviews and examination alone in 260 patients. Metastases could be detected clinically in 105 patients. A seemingly small number of patients had club fingers (7%) and laryngeal nerve paralysis (4.7%). Correct diagnoses of pulmonary cancer were made with routine films or by special examination in 90 per cent of the cases. Bronchoscopy was clinically positive in 62 per cent of patients examined, but only 42 per cent of bronchoscopic biopsies were positive. Papanicolaou smears of sputum were positive in 50 per cent of 117 proved cases; there was one false positive smear.

The locations and pathological varieties of tumors found are listed. It was noted that adenocarcinoma (43 cases) differed from the more common epidermoid (136) and undifferentiated (90) cancers in that one-third of the former were in women, and at least one-third of the women did not smoke. Those differences suggest a difference of etiology.

The question of operability is generalized; supraclavicular or axillary lymph node metastases with involvement, by extension, of the ribs, sympathetic nerves (Horner's syndrome), brachial plexus, recurrent laryngeal or phrenic nerves, or with pleural effusion are considered inoperable. For these or other reasons 46.2 per cent of the patients were not subjected to thoracotomy.

Of the total number of 403 patients, 217 were operated upon and in 104 of these, resection was performed. The question of lobectomy has not been resolved; 32 lobectomies were performed by a radical technique which takes the lobar artery at or close to its origin. In recent years a combination of radical surgery with massive roentgen therapy, using the 2 million-volt equipment of the Massachusetts Institute of Technology, has been attempted, with the aim of rendering inoperable lesions resectable during the term of irradiation. Admittedly, the surgery is made more difficult by prior irradiation. Pneumonectomy must be done to remove the destroyed lung, and a period of 1 to 2 months is allowed to elapse before the operation is carried out. Although the results of the combined therapy await full evaluation, the experience with 97 patients is tabulated.

In the group of 104 resections, 96 of which were performed for cure, there were 8 operative deaths.

Survival data are presented in extended tabular form.

—Leonard D. Rosenman, M.D.

HEART AND PERICARDIUM

Ventricular Fibrillation During Cardiac Surgery. B. B. Milstein and Sir Russell Brock. *Guy's Hosp. Rep.*, Lond., 1954, 103: 213.

The present report on ventricular fibrillation during cardiac surgery is probably the most comprehensive contribution on this subject yet to appear. The data are mainly clinical and have been obtained from an unusually wide experience, supplemented by laboratory studies by the authors and others.

In a brief abstract it is impossible to present many of the specific facts discussed. The following aspects of the subject are covered: (1) precipitating factors in ventricular fibrillation; (2) methods of treatment; (3) the prognosis in ventricular fibrillation; and (4) the electrocardiographic change preceding and following ventricular fibrillation.

The most outstanding conclusions are that: (1) direct cardiac massage is almost impossible to overevaluate; (2) any intracardiac obstruction must be relieved if reversion of ventricular fibrillation to normal rhythm is to be successful; and (3) satisfactory ventilation with consequent oxygenation of the blood is essential to recovery from ventricular fibrillation.

These are merely a few broad conclusions from the many detailed topics discussed. It is a contribution important to everyone interested in thoracic surgery.

—*Robert W. Williams, M.D.*

Intracardiac Surgery Under Direct Vision; Closure of Atrioseptal Defects in Dogs Using Artificial Hibernation (Hypothermia). P. K. Sen, P. A. Bhatt, and C. B. Shah. *Ind. J. Surg.*, 1954, 16: 250.

The authors report the results of their experiments with 30 mongrel dogs, in which cardiotomy was performed under hypothermia with complete caval occlusion, and they present one clinical case. Electrocardiograms, rectal temperatures, and blood pressures were taken during each experiment. In 16 of the animals an atrial septal defect was created, in 8 an atrial septal defect was made and closed at the same time, and in 6 closure of a previously constructed defect was carried out.

In each of the 3 groups there was a 50 per cent mortality from ventricular fibrillation or cardiac standstill and these were not differentiated. Analysis of the events leading up to these deaths did not reveal any single factor which was responsible, and the authors concluded that an "unknown factor or factors rendered the hypothermic heart particularly susceptible to ventricular arrhythmia and fibrillation."

An attempt was made to repair an interatrial septal defect in a 24 year old male with use of a technique essentially similar to the experimental one. In this case ventricular fibrillation occurred as the patient was being moved from the cooling chamber to the operating table. The rectal temperature was 28 degrees C. Cardiac massage was successful in producing normal sinus rhythm and the patient rewarmed, but 6 hours later died with another bout of ventricular fibrillation.

—*Robert W. Williams, M.D.*

The Surgical Correction of Mitral Insufficiency. Dwight E. Harken, Harrison Black, Laurence B. Ellis, and Lewis Dexter. *J. Thorac. Surg.*, 1954, 28: 604.

The problem in pure mitral insufficiency is that of the absolute or relative loss of leaflet substance. To correct this loss of substance there must be either a substitution of substance or a reduction of the size of the annulus. Various techniques have been advanced to accomplish these ends. Evidence is presented in support of the use of a smooth lucite baffle or prosthesis, so placed in the mitral orifice as to obstruct the regurgitant jet in systole without interfering with leaflet mobility and the forward blood flow in diastole.

The first baffle was spherical in shape, (the ball baffle); the second was more effective as it was bottle-shaped and was placed across the orifice with the base anchored to the anterolateral aspect of the annulus with the neck of the bottle riding under the opposite portion of the annulus; the spindle-shaped baffle, anchored at both ends across the orifice, is apparently the most stable and efficient. The rationale and technique of this operation are presented in the light of early clinical results on 17 patients.

The conceivable pathologic states apparent in mitral valvular disease are: absolute loss of leaflet substance; relative loss of substance; directional—i.e., when a stenotic mitral orifice faces into the left ventricular outflow tract; malocclusion—i.e., when the calcified leaflet margins fail to seat properly when the valve closes; and the combined pathologic processes.

The essence of the technique of the spindle-baffle operation for the correction of mitral insufficiency consists in the placing of the baffle by employing a 12 cm. malleable needle with three strands of braided No. 1 nylon suture swedged on its end and tunnelled through the myocardium so that it enters the chamber of the left ventricle near the anterior commissure. The point of entry is in an avascular area between the anterior descending and the circumflex branches of the left coronary artery. It is then threaded up through the appropriate spindle-baffle. It is then reinserted into the left auricle, using the finger as a guide, and directed so as to pierce the auricular surface of the posterior segment of the mitral annulus. The needle is finally pushed through the ventricular myocardium beneath the coronary sinus and circumflex coronary artery, to exit from the heart just medial or just lateral to the posterior descending coronary artery on the phrenic aspect of the left ventricle.

Among the 18 patients on whom the procedure has been done there were 4 immediate deaths, and 1 late failure. The surviving patients, however, have had incomparably smoother postoperative courses than those patients who have had other types of surgery for the correction of mitral insufficiency, and observation of the patients since discharge from the hospital is encouraging.

—*Stephen A. Zieman, M.D.*

Changes in Pressures in the Left Atrium and Pulmonary Artery Immediately Before and After Mitral Valvuloplasty. Paul N. Yu, Frank W. Lovejoy, Jr., Robert E. Nye, Jr., Howard A. Joos, and Others. N. England J. M., 1954, 251: 764.

The purpose of this report is to correlate the changes in pressure patterns of the left atrium and pulmonary artery in mitral stenosis with the clinical response to valvuloplasty. Pressures were measured by a 22 gauge needle puncture made directly at the operating table. Twenty-five individual patients comprised the clinical material.

The mean left atrial pressure in normal subjects is below 10 mm. of mercury. All but 4 of these patients had preoperative mean atrial pressures over 20 mm. of mercury. The mean atrial pressures declined by more than 4 mm. in all but 4 cases. The excellent clinical results all showed more than a 30 per cent drop in the mean atrial pressure, whereas the good results showed but a 15 to 30 per cent drop. Patients with minimal or no clinical benefit showed only minor reductions in atrial pressures immediately after valvuloplasty.

The mean pulmonary artery pressure in normal subjects ranges from 12 to 20 mm. of mercury. There was no good correlation of the changes in mean pul-

monary artery pressure before and after valvuloplasty with the clinical result obtained.

The principal conclusions are that (1) at present direct needle recording of the atrial pressure at open thoracotomy is the only safe means of measuring atrial pressure, and (2) the percentage decrease in mean atrial pressure immediately after mitral valvuloplasty gives the most accurate estimation of the functional result to be anticipated.

—*Robert W. Williams, M.D.*

Treatment of Certain Coarctations with Homologous Grafts, Fixed in 4 Per Cent Formalin. J. F. NUBOER. *Arch. chir. Neerl.*, 1954, 6: 123.

WHILE MOST CASES of coarctation of the aorta can be treated by resection of the stenotic segment and end-to-end anastomosis, there are a number of instances in which this procedure is not feasible, and other cases in which it is not advisable. Homologous grafting of the aorta must be considered, according to the author, in the following conditions:

1. Long stenotic segments
2. Coarctations in older patients with rigid aortas
3. Aneurysmal dilatation of the aorta distal to the coarctation
4. Aneurysmal dilatation of the intercostal arteries
5. Most cases of lower thoracic and abdominal aorta coarctation
6. Recurrences of aortic coarctation

The author obtains grafts by removing aortas from corpses without asepsis. Branches are cut off and tied off or sutured. The aorta is then slipped over a glass tube and fixed in 4 per cent formalin with a *p*H of 5.6. The aorta is preserved at room temperature for 10 to 14 days and then is ready for use. It may be kept for 6 months or longer. Before it is used, the specimen is rinsed for 24 hours in sterile saline solution, and then placed in saline solution to which penicillin and heparin have been added.

The author treated 8 cases of coarctation of the aorta by means of resection of the stenotic segment and homologous grafts fixed in formalin, in all of which the operation was successful. Admittedly, the postoperative periods are still short, but so far the results indicate that such grafts attach themselves very well. They do not possess any drawbacks compared with fresh grafts, and may even have the advantage that the elastica remains intact longer than in fresh homologous grafts. Calcification of the graft, so fixed, has not been observed.

In operations for coarctation in all patients more than 20 years of age, homologous grafts should be on hand. With this method of fixation, it is possible to maintain a "bank" of blood vessel grafts.

—*Robert Paradny, M.D.*

Operations for Coronary Artery Disease. CLAUDE S. BECK and DAVID S. LEIGHNINGER. *J. Am. M. Ass.*, 1954, 156: 1226.

OPERATIONS FOR CORONARY ARTERY DISEASE have progressed during the last 22 years primarily on the basis of experimental work. The basis for these operations depends upon supplying an increased blood flow to the myocardium either through vessels from places outside of the heart or by increasing the intercoronary circulation. Four to five thousand experimental operations were performed on coronary blood vessels in dogs and 186 operations on patients with coronary artery disease.

Two major concepts need be elucidated before the experimental procedures can be understood. The concept of a trigger mechanism must be accepted. An ischemic area of myocardium that is potentially capable of sending impulses out may destroy the normal mechanism, while the myocardium itself is capable of continued contraction. Analysis of 950 deaths from coronary artery disease by Yater and his group indicated that a mechanism death occurred in approximately two-thirds of instances. The second concept is the role played by intercoronary circulation. It was reported that intercoronary arterial channels were found in every heart in which a major coronary artery was completely and chronically occluded. The absence of these vessels in acute occlusions is interpreted to mean that a sufficient period of time following coronary artery occlusion had not elapsed in order that these anastomoses could develop. In only 9 per cent of patients whose hearts did not have coronary artery disease was it possible to find intercoronary channels. From an experimental standpoint, it has been found that the addition of only a small amount of blood flow to the myocardium will decrease the size of the infarct and prevent death after major coronary ligation.

The evaluation of experimental studies has been accomplished by two means. First, the coronary artery ligation-mortality-infarct method was used. The mortality rate and infarct size were determined in a control group after ligation of the descending ramus or circumflex ramus of the coronary artery. The same procedure was carried out in an experimental group after some operation had been performed to improve the coronary blood flow. These two groups were then compared. The second means of assessing the value of experimental procedures has been the determination of the retrograde flow from the circumflex ramus of the left coronary artery—the so-called Mautz-Gregg backflow method.

The number 1 operation consists of abrasion of the epicardium and lining of the parietal pericardium, application of an inflammatory agent to these surfaces, partial occlusion of the coronary sinus where it enters the right auricle and grafting of the parietal pericardium and mediastinal fat to the surface of the heart. The number 2 operation consists of first shunting arterial blood to the coronary sinus by means of a free vein graft between the aorta and coronary sinus or by direct anastomosis between these structures. The second stage of this operation is done 2 to 3 weeks later and consists of partial occlusion of the coronary sinus as it enters the right auricle.

In a control group following major coronary artery ligation 70 per cent of the animals died, but when operation number 1 was performed only 26.6 per cent died. Of the animals on which operation number 2 was performed only 8.9 per cent died. Therefore, the saving by operation number 1 was 43 per cent and by operation number 2, 60 per cent. Backflow studies demonstrated that operation number 1 increased the coronary backflow by 6.1 c.c. per minute. Operation number 2 increased the backflow by 10.9 c.c. per

minute. If an interval of 3 to 4 months had lapsed after the operations and artery ligation, then the average backflow was 55 c.c. per minute after operation number 1 and after operation number 2 it was found to be 81 c.c. per minute. Thus, it would appear that coronary artery ligation plus time produces large backflow values. Either operation number 1 or number 2 helps provide the time factor after artery ligation. In the dog, after the first 2 months, blood flow through the graft in operation number 2 ceases. Backflow after the Sham operation on the heart planned after operation number 2 but without the passage of blood through the shunt increases the backflow by 4 c.c. per minute. It would appear that the trauma incidental to surgical operation on the heart increases intercoronary anastomosis.

The clinical studies demonstrate that the mortality rate from operation No. 1 is 7.5 per cent and from operation No. 2, 26.1 per cent. Four of 5 patients operated on returned to work with little or no pain. There must be a rigid selection of patients. The most acceptable patient is a lean person in the forties or fifties, who has had coronary disease a year or more, has pain, but is still able to get around. The operation is delayed for at least 6 months following an infarct. Patients with heart failure or in whom the heart is giving way or enlarging are not candidates for operation; however, those with moderate enlargement of the heart and those with status anginosus are accepted. Three months to 5 years after operation 85 per cent of the patients who had undergone operation number 1 and 88 per cent of those who had undergone operation number 2 were benefited.

Operation number 2 decreases the size of the infarct to a greater extent than operation number 1, and reduces the mortality to a greater extent; however, it requires special training and must be done in stages. Mild failure may be produced by operation number 2 and the graft ultimately loses contact with the capillary bed in dogs. At present, the authors cannot answer the question which is the preferable operation and are doing the number 1 operation.

—*Jerry A. Stirman, M.D.*

Experiences in the Surgical Treatment of Aortic Stenosis. William H. Muller, Jr., Albert A. Kattus, Jr., J. Francis Dammann, Jr., and Rodney T. Smith. *J. Thorac. Surg.*, 1954, 28: 516.

Acquired aortic stenosis resulting from rheumatic heart disease is the second most common acquired stenotic valvular deformity. The authors present the results in 25 patients with aortic stenosis after using a ventricular approach and a dilating instrument to open the valve.

In aortic stenosis the primary physiologic derangement is a marked increase in resistance to emptying of the left ventricle which results in hypertension within this ventricle. Usually there is low aortic systolic pressure and a relatively normal diastolic pressure resulting in a small pulse pressure. Reduced coronary blood flow accentuates the strain imposed on the left ventricle by the stenotic valve. If the mitral valve is also affected by the rheumatic process, mitral insufficiency is more likely to occur because of the increased left ventricular pressure.

Candidates for aortic valvulotomy by present techniques should have relatively pure aortic stenosis. If a mitral lesion is also present it should be predominately stenotic. Many patients with aortic stenosis have diastolic murmurs characteristic of aortic insufficiency but unless other findings, such as low diastolic pressure, an excessively enlarged left ventricle, and a great intensity of the diastolic aortic murmur, are present, the operation should be performed. Age is not a limiting factor, but patients over 50 should be considered cautiously. Patients with congenital aortic or subaortic stenosis should be operated upon if the electrocardiogram and the roentgenographic examinations give evidence of left ventricular strain and enlargement. Those patients with a murmur characteristic of aortic stenosis and no symptoms whatsoever should not be operated upon. The rest should be operated upon, those with severe symptoms and evidence of heart failure to be prepared preoperatively with digitalis, diuretics, and bed rest. It is important to operate on patients with aortic stenosis as early as possible, especially if they have had severe symptoms, because they may develop fatal left ventricular failure after only one or two episodes of failure. Contraindications to operation include marked aortic insufficiency, complete heart block, subacute bacterial endocarditis, low myocardial reserve, and acute rheumatic fever.

The authors give a detailed description of their technique with valuable methods of minimizing blood loss and controlling bleeding from the ventricle. Ventricular fibrillation was not encountered in this series.

When mitral stenosis was present in addition to aortic stenosis both valves were opened in a single stage procedure, the valve which was most significantly involved being opened first; that is, if the patient's symptoms were primarily those of angina or syncope, the aortic valve was opened first, but if they were primarily pulmonary edema, dyspnea, and orthopnea, the mitral valve was opened first.

Twenty-five patients were operated upon in this series; 16 had aortic deformities alone, 8 had mitral valvular deformities as well as aortic, and 1 had aortic stenosis and a coarctation of the aorta. Their ages ranged from 14 to 63 years. Of the 16 with isolated aortic valvular disease, 6 had pure aortic stenosis and 10 had aortic stenosis and insufficiency. There were 4 operative deaths, 2 in the group with aortic disease alone, and 2 in the group with dual deformities. There were 2 late deaths.

In none of the patients has the murmur disappeared but in some it became less intense. In several patients the diastolic murmur increased after operation. In some patients the heart size decreased, in others it remained unchanged or even became larger. Among the 19 living patients, the longest follow-up is 18 months and the shortest, 2 weeks. Three of the patients operated upon less than 2 months ago were not included for the evaluation of results. Of 12 patients with aortic deformities alone, 1 showed slight improvement, 4 considerable, and 7 excellent improvement. Four of those with mitral and aortic deformities showed excellent improvement. The patient with coarctation of the aorta and aortic stenosis was also considered to show excellent improvement.

The authors conclude that although the ultimate results can be determined only after follow-up of the patients for a long period, the early results are encouraging. —*Robert Paradny, M.D.*

Surgical Treatment of Chronic Constrictive Pericarditis. HARRIS B. SHUMACKER, JR. *Am. Surgeon*, 1954, 20: 1137.

THE FIRST CARDINAL PRINCIPLE in the management of chronic constrictive pericarditis is early recognition of the condition and early operative treatment. Diagnosis should ordinarily not prove difficult if this disorder is constantly kept in mind as a possible cause of cardiac failure, and particularly in those instances in which common causes of myocardial failure are not present. The importance of quiet heart sounds, poor cardiac pulsations as observed by fluoroscopic or kymographic study, elevated venous pressure, low arterial pressure and small pulse pressure, and low voltage and flat or inverted T waves, is emphasized. In cases of chronic constrictive pericarditis without evidence of acute inflammation, Schumacker advises operation once the diagnosis is established, the patient is in optimal condition, and is as free as is possible of water retention; in patients resistant to improvement by medical management it is futile to defer operation. Recent experience indicates that operation can now be safely undertaken without delay on streptomycin-treated patients with tuberculosis if cardiac compression causes prominent, incapacitating, or progressive effects.

The author prefers the complete sternal-splitting incision with wide retraction of the divided edges of the sternum to approach the pericardium. Extensive resection of the pericardium is emphasized; a small resection may not bring relief and further decortication may be necessary. From recorded clinical and experimental data it is clear that surgical treatment should be as complete removal of the diseased pericardium as is possible and that under any circumstances the ventricles must be freed. An effort should be made to free the atria and great vessels as well.

The case summaries of 9 patients who were treated, 7 with classical examples of generalized constrictive pericarditis, are presented. Five of the 7 are well for all practical purposes following operative pericardial resection. —*Edwin J. Pulaski, M.D.*

The Pathologic Anatomy in Morbus Caeruleus (Pathologische Anatomie des Morbus Caeruleus). H. MEESSEN. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 279: 474.

THE PATHOLOGIC CHANGES in congenital heart lesions with a right to left shunt result in a chronic oxygen insufficiency, which is present in all the organs. By means of postmortem angiography the author demonstrated the changes in the vascular system and in the viscera.

Among 134 autopsies (1949–1954), there were 4 cases of atresic stenosis, 5 cases of tricuspid pulmonary atresia, 8 cases of "pure" pulmonary stenosis, 54 cases of tetralogy of Fallot (valvular stenosis, infundibular stenosis or both), 1 case of deep infundibular stenosis, 3 cases of ductus arteriosus, and 23 cases of coarctation of aorta. In 54 cases of tetralogy of Fallot, changes in the endocardium were seen, especially in intact pulmonary valves.

In examinations of the brain, dilatation and tortuosity of the meningeal vessels were grossly present, and also erosion of the internal table. The capillaries of the brain and the retina were dilated as well as the intracerebral veins. No particular change could be seen in the intracerebral arteries. It was believed that changes in the parenchyma, like small abscesses for instance, were of an embolic thrombotic genesis. No changes of cells in the pallidum could be demonstrated.

In the periportal area of the liver, the vessels of the porta were dilated, and occasionally small arteries showed hyalinization.

In the kidneys the glomeruli were dilated and ectasia was seen. In the spleen, megakaryocytes were present.

In the cortex of the adrenals adenomatous hyperplastic transformation could be seen, as well as regressive changes. The findings in the marrow were similar to those which occur in exhaustion and carbon dioxide respiration.

The skeleton in morbus caeruleus is characterized by an increased number of vessels and numerous perforating vessels, the marrow is filled with dilated veins, and the trabeculae are atrophic. Similar changes occur in jaw bones and tooth buds. Clubbed fingers and toes show lacunar resorption of the bone.

It was concluded that the concentration of carbon dioxide could be the cause for the generalized venous dilatation. —*Frank R. Lichtenheld, M.D.*

ESOPHAGUS AND MEDIASTINUM

A Method of Preventing Peptic Esophagitis Following Esophagogastrostomy; Experimental and Clinical Study. DAVID H. WATKINS, ARTHUR PREVEDEL, and FRED R. HARPER. *J. Thorac. Surg.*, 1954, 28: 367.

VALVULAR ESOPHAGOGASTROSTOMIES were carried out in dogs in which the entire stomach pouch was preserved. These dogs have survived without evidence of appreciable esophagitis for periods varying from 63 to 234 days, and were still living at the time of this report.

The procedure described has been carried out in human patients with encouraging clinical and roentgenologic results. It has the advantage of being applicable to both high and low esophagogastrostomies.

—*John J. Maloney, M.D.*

Critical Review of the Outlook for Patients Treated Surgically for Cancer of the Esophagus; Report of a 5 Year Survival (Revue critique de l'avenir des cancers esophagiens opérés à propos d'une survie de 5 ans). CL. OLIVIER and R. FLORENT. *J. chir.*, Par., 1954, 70: 691.

THE AUTHORS report the case of a patient who died of a carcinoma of the pyriform sinus 5 years and 3 months after an esophageal resection and esophagogastrostomy for carcinoma of the esophagus. The patient had dysphagia for 8 months prior to resection. The lesion involved the esophagus at the level of the diaphragm. Histologically it was a squamous celled epithelioma. At postmortem no evidence of esophageal cancer was found.

The authors reviewed the world literature and cited 26 articles by 23 authors reporting cases of carcinoma of the esophagus treated surgically. These authors reported that 39 patients survived 5 years or more and 10 survived 10 or more years after resection. Thus, the outlook for patients with carcinoma of the esophagus treated by present day methods is extremely poor, although it is somewhat better for lesions of the lower third of the esophagus than for lesions located at a higher level. —*Frederick W. Preston, M.D.*

MISCELLANEOUS

Recognition and Operative Treatment of Diaphragmatic Hernia (Zur Erkennung und operativen Behandlung von Zwerchfellhernien). G. HEBERER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 328.

THE AUTHOR'S REMARKS are based on the observation of 19 patients with diaphragmatic hernias, 11 of whom were successfully operated upon.

The transthoracic approach is preferable to the abdominal because the exposure is better and the closure of the defect is facilitated. Reduction of the mortality, attributable to the introduction of antibiotics, improved methods of anesthesia, and advances in surgery of the chest justifies the advice of an early operation.

Not only congenital but also traumatic hernias often escape detection for a long period of time. An early operation is indicated in the presence of cardiopulmonary or gastrointestinal symptoms and anemia due to occult or manifest massive hemorrhages, because in 15 per cent of the cases belonging to this group incarceration of the stomach or intestines with ileus, caused by strangulation, volvulus, or progressive stenosis, may be expected.

Advanced age, a grave condition of the heart or other vital organs, or complete absence of symptoms contraindicate an early operation. Inasmuch as an abnormally short or so-called brachyesophagus shows a tendency toward stricture or perforation of an ulcer in the endothoracic portion of the stomach, this condition, if combined with a congenital hiatus hernia, should be treated surgically as soon as recognized. Phrenicoexeresis, gastrostomy, vagotomy, or dilatation of the esophageal hiatus are rarely followed by success.

The treatment of choice consists of thoracotomy, isolation of the intrathoracic portion of the stomach and the lower end of the esophagus, section of the phrenic nerve, reposition of the stomach into the peritoneal cavity, and finally the formation of a new hiatus by elevation of the tendinous portion of the diaphragm.

If grave symptoms are present congenital diaphragmatic hernias can be repaired in childhood and even in infancy.

Paradox mobility of the involved half of the diaphragm, recognizable roentgenologically, allows differentiation of a paralysis of the diaphragm caused by a trauma of the phrenic nerve from congenital diaphragmatic hernia.

The author reports a rare bilateral Morgagni's parasternal hernia in a 57 year old man.

—*Joseph K. Narat, M.D.*

The Surgery of Infundibular Pulmonic Stenosis with Intact Ventricular Septum (a Type of "Pure" Pulmonic Stenosis). ROBERT P. GLOVER, THOMAS J. E. O'NEILL, HUGO GONTIGO, THOMAS C. MCAULIFFE, and C. ROBERT E. WELLS. *J. Thorac. Surg.*, 1954, 28: 481.

WHILE PULMONIC STENOSIS is usually valvular in type when the interventricular septum is intact and infundibular in type when there is an interventricular septal defect, the authors present 6 cases of pulmonic stenosis of the infundibular type in which the ventricular septum was intact.

The authors refer to pulmonic stenosis (valvular, infundibular, or combined) with an intact ventricular and atrial septum as pure pulmonic stenosis, and to pulmonic stenosis with an intact ventricular septum but with an interatrial communication as the tetralogy of Fallot.

The symptoms and signs of these two entities are related to an increased pressure in the right ventricle and often to a decreased pulmonary blood flow.

Until recently, pure pulmonic stenosis and the tetralogy of Fallot have been considered very rare. In a series of 25 patients with pulmonic stenosis and intact ventricular septa operated on by the authors, there were 6 in whom the stenosis was infundibular or of a combined valvular and infundibular type.

A definitive diagnosis of pulmonic stenosis with intact ventricular septum can be made only by interpreting the results of cardiac catheterization.

Dyspnea on exertion and out of proportion to the degree of cyanosis is the most frequent symptom of pure pulmonic stenosis, and is accompanied by easy fatigability. Inadequate weight gain is common and squatting may occur, but is less frequent than in the tetralogy of Fallot. In pure pulmonic stenosis there is usually no cyanosis. The chest may be symmetrical or may show precordial bulge due to hypertrophy of the right ventricle. Cardiac enlargement is usually not detected clinically. There is a systolic murmur and often a systolic thrill at the second left interspace. The pulmonic second sound is often clear and decreased in intensity, but there may be a normal or loud pulmonic second sound. The liver is usually neither enlarged nor pulsating. Systemic systolic pressure is usually below 100 mm. Hg and the pulse pressure is narrow. The hemoglobin, red cell count, and the hematocrit are usually normal and the circulation time is normal or slightly prolonged.

An electrocardiogram reveals right axis deviation, right ventricular hypertrophy, and often tall, peaked P waves suggesting right atrial enlargement or strain. Fluoroscopy reveals the heart to be normal or moderately enlarged. The apex is often elevated and the pulmonary conus convex. The pulmonary artery and its main branches at the hilum are usually large but quiet. The lung fields are clear. The right ventricle is enlarged and the pulmonary window is not clear.

Cardiac catheterization usually reveals elevated right atrial pressures. The systolic pressure in the right ventricle is always elevated and is directly related to the degree of stenosis. A pressure in the right ventricle significantly higher than the systemic systolic pressure is diagnostic of pulmonic stenosis with an intact ventricular septum. The pressures in the pulmonary artery may be normal but are usually decreased. Oxy-

gen studies performed on samples of blood taken at cardiac catheterization reveal no evidence of intracardiac shunts, and the pulmonary and systemic blood flows are equal and usually decreased. Angiocardiography reveals that the dye follows a normal course. The significant findings which, however, are not constant, are the retention of dye in the right ventricle, visualization of the poststenotic pulmonary artery dilatation, and the decreased vascular markings in the outer two-thirds of the lung field.

The tetralogy of Fallot may be indistinguishable from pure pulmonic stenosis if the right-to-left shunt at the atrial level is insignificant. With larger shunts, cyanosis is usually present, at first with exertion and later at rest. Associated with the cyanosis there is polycythemia and later clubbing of the fingers and toes. If the right-to-left shunt is large, the circulation time is decreased. Right atrial pressures are elevated and the shunt is from right to left. If the diagnosis of pulmonic stenosis with an intact ventricular septum has been established, the passage of the catheter through an interatrial communication differentiates a pure pulmonic stenosis from a tetralogy of Fallot. If the right-to-left shunt is large, angiocardiography will initially reveal poor opacification of the left atrium, ventricle, and aorta, followed later by reopacification of these chambers and of the aorta, and the systemic blood flow will be greater than the pulmonary blood flow.

Differential diagnosis of valvular and infundibular stenosis is extremely difficult and at the present time valvular stenosis cannot be positively differentiated clinically from infundibular or combined stenosis. A split second sound at the base tends to exclude the diagnosis of pulmonic stenosis. Whenever this finding is present in association with the other findings of pulmonic stenosis with an intact ventricular septum, it is suggestive evidence of an infundibular stenosis with a normal pulmonary valve. Fullness or convexity of the pulmonary artery segment suggests the presence of a large poststenotic dilatation of the pulmonary artery and thus favors a diagnosis of a valvular type of stenosis. Straightness or concavity of the pulmonary artery segment suggests the presence of a normal or hypoplastic pulmonary artery with an infundibular rather than a valvular stenosis. The continuous recording of pressures while withdrawing the catheter from the pulmonary artery under fluoroscopy is the best method of differentiating the various types of stenosis.

In pulmonary valvular stenosis there is a sharp rise of the systolic pressure and a fall of the diastolic pressure to zero or negative values at the level of the pulmonary valve. In infundibular stenosis the systolic pressure is approximately the same in the pulmonary artery and in the infundibulum distal to the stenosis. Proximal to the stenosis there is a sharp rise in the systolic pressure. The diastolic pressure falls at the level of the pulmonary valve and remains constant in the right ventricle proximal and distal to the stenosis. In combined stenosis there is a rise in the systolic pressure in the region between the valvular and infundibular stenosis, followed by a second rise proximal to the infundibular stenosis. The diastolic pressure falls proximal to the valvular stenosis and then is of the same magnitude in the right ventricle proximal and distal to the infundibular stenosis.

At the time of surgery the site and degree of stenosis can be ascertained by both extracardiac and intracardiac exploration. In valvular stenosis poststenotic dilatation is usually seen in the pulmonary artery and a systolic thrill is palpable distal to the valve. By digital invagination of the pulmonary artery the orifice of the pulmonary valve can be obliterated with resultant disappearance of the thrill. The valve is palpated as a stiff, dome-shaped structure. A high and short infundibular stenosis immediately subjacent to the valve may simulate these findings. In the typical infundibular stenosis the thrill is best felt in the wall of the outflow tract of the right ventricle, distal to the stenosis, but it may extend into the pulmonary artery. A short infundibular stenosis of the diaphragmatic type (membranous) produces a poststenotic, thin-walled ventricular chamber. The more common, long, narrow infundibular stenosis (myocardial) is usually associated with hypertrophy of the outflow tract. Combined infundibular and valvular stenosis is frequently associated with a hypoplastic pulmonary artery.

Severe hypertension in the right ventricle (over 100 mm. Hg) with an elevated diastolic pressure or a great reduction in pulmonary blood flow are definite indications for surgery. Polycythemia, stunting of growth, electrocardiographic evidence of severe right ventricular hypertrophy, and myocardial strain are further indications.

The authors have previously described the surgical technique and in this communication stress certain modifications. After a successful valvotomy or infundibular resection, the portion distal to the stenosis becomes full, tense, and resists compression. Tolerance to activity increases, and cyanosis, if present, usually disappears at or shortly after surgery. The murmur and thrill may change in intensity, become more diffuse, or occasionally disappear. Increased cardiac enlargement roentgenographically often occurs shortly after operation and persists for variable periods of time. The pulmonary vessels usually appear more conspicuous and pulsate more vigorously. Some writers report a significant decrease in right ventricular and atrial pressures but others report no significant change. Some increase of the pulmonary blood flow occurs and the peripheral arterial oxygen saturation, if previously it was low, rises to normal or near normal.

The patient with pulmonic stenosis with an intact ventricular septum usually progresses from an asymptomatic period to a period of increased symptoms, followed by rapid deterioration terminating in failure on the right side. Prior to surgery the life expectancy averaged from 25 to 30 years. In the authors' experience the mortality from direct intracardiac valvotomy and infundibular resection varied with the type of malformation for which they were used. In tetralogy of Fallot and similar malformations the over-all mortality has been 20 per cent of 60 surgically treated cases, while in pulmonic stenosis with an intact ventricular septum there have been no deaths in 25 cases treated surgically (19 valvular, 4 infundibular, and 2 combined). —*Robert Paradny, M.D.*

A Simple Cervicomediastinal Exploration for Tissue Diagnosis of Intrathoracic Disease; with Comments on the Recognition of Inoperable Carcinoma of the Lung. DWIGHT E. HARKEN, HARRISON BLACK, ROY CLAUSS, and ROBERT E. FARRAND. *N. England J. M.*, 1954, 251: 1041.

THE ADVANTAGES of biopsy of scalene lymph nodes for the diagnosis of intrathoracic diseases have been supplemented by the addition of exploration of the superior mediastinum. The procedure has been performed in cases of pulmonary disease presenting diagnostic problems and in patients having suspected or proved carcinoma of the lung, to determine operability. The availability of tissue diagnosis in approximately a third of the patients, and in 40 per cent of those with carcinoma of the lung, indicates the value of the simple maneuver.

The procedure is generally carried out in conjunction with diagnostic bronchoscopy. The patient's position and the skin incision are those used to expose the phrenic nerve. By blunt finger dissection the superior mediastinum is entered and any mass is removed either with the finger or a laryngeal forceps under direct vision. Needle exploration of a pulsating mass, or Silverman needle biopsy of tumors may also be carried out. If the mediastinal exploration is negative, the carotid sheath and retrosternal areas are examined, and any suspicious nodes removed.

Despite the apprehension expressed by internists and thoracic surgeons that serious complications would result from this procedure, experience with 300 operations resulted in hemorrhage twice, caused by injury to the subclavian or internal jugular vein, but it was readily controlled with gelfoam. A pneumothorax was produced in two instances, but catheter aspiration through the operative site expanded the lungs as the incision was closed.

One-hundred and forty-two cases are reviewed from June, 1950 through March, 1953. A positive histologic diagnosis was obtained in 45, or 31.7 per cent. There were 78 cases in which a tissue diagnosis of bronchogenic carcinoma was possible by bronchoscopic biopsy, or biopsy at the time of thoracotomy. Of these, 31 patients (39.8 per cent) had metastases to the cervical or upper mediastinal lymph nodes, which were not evident on physical examination.

When cervicomediastinal metastases have been demonstrated, the likelihood that aggravation by resection would exceed the chance of palliation is apparent. If the preoperative study does not indicate extension or other more commonly accepted evidence of inoperability (such as tracheal invasion, distant metastases, or positive pleural fluid), and the patient is subjected to the discomfort of operation, the policy of radical excision with block dissection of the lymphatics is advised. —*Stephen A. Zieman, M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Clinical Aspects of Tumors of the Mesentery (Zur Klinik der Mesenterialtumoren). GEORG WERNER GROSS and ALBERT G. WEYER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 425.

APPROXIMATELY 700 cases of tumors of the mesentery have been reported in the literature.

All such tumors may be divided into 3 groups: benign formations, transitional forms, and malignant neoplasms.

The term "tumor of the mesentery" refers to its topography but not to its origin which may take place in the mesentery itself, in the retroperitoneal space, or in the interstitial connective tissue of the muscular layers of the intestinal tract.

Among the benign tumors, cystic formations lead in frequency; they are usually either chylous cysts or dermoid cysts, but occasionally may develop from a strangulated diverticulum of the gastrointestinal tract. It is improbable that mesenteric cysts represent residues of a nonobliterated omphaloenteric duct.

The following 4 types of mesenteric tumors are rarities: cavernous lymphangioma, teratoid tumor, lipoma, and myoma. Fibroma of the mesentery may be mistaken for a renal tumor. This type of tumor is subject to cystic, myxomatous, or malignant degeneration and therefore should be completely removed.

The transitional group is represented by myxofibroma and mesenchymoma. The last mentioned growth infiltrates the surrounding tissues and may recur after extirpation, but forms no metastases. The entire group shows a tendency to malignant degeneration.

The malignant group comprises sarcomas and the extremely rare carcinomas. The authors report 4 cases of sarcoma and state that such neoplasms may show signs of fatty degeneration or calcium deposits and that they may perforate the intestinal wall. Metastases usually develop only in advanced stages.

The following signs dominate the clinical picture: pressure symptoms, partial or complete intestinal obstruction, and strangulation.

Retropneumoperitoneum is of very limited diagnostic value, while intravenous or retrograde pyelograms and series of x-ray films of the gastrointestinal tract may suggest the presence of a tumor of the mesentery. In the majority of cases the correct diagnosis is made only at the time of exploration.

In the differential diagnosis, one should consider cyst of the ovary or of the pancreas, a pregnant uterus, a tumor of the spleen, a retroperitoneal aneurysm, or a renal tumor. —*Joseph K. Narat, M.D.*

GASTROINTESTINAL TRACT

The Total Circulating Serum Protein in Patients with Gastric Carcinoma. BJARNE FRETHEIM. *Acta chir. scand.*, 1954, 108: 125.

PATIENTS suffering from carcinoma of the stomach usually have a reduced hemoglobin percentage and total hemoglobin, a reduced serum protein concentration, and a relatively lesser reduction of the total circulating serum protein. The blood volume is only slightly reduced, but may be normal or even higher than normal. The red cell volume is almost always more or less reduced. The plasma volume may be reduced, though it is often normal.

The more advanced the carcinoma and the more marked the anemia, the more do these values deviate from the normal. It is important that blood transfusions be given preoperatively, for the purpose of attaining nearly normal values.

Since the blood volume deviates only slightly from the normal, it may be feared that too much blood may be given. This is not so. The organism adjusts itself rapidly to new conditions of equilibrium. Fluid and serum protein leave the circulation and are replaced by hemoglobin and red blood cells; it appears as if the hemoglobin and serum protein are in dynamic equilibrium, and substitute for each other in an effort to maintain a normal blood volume. When the hemoglobin falls, the serum protein rises.

Since a large portion of the transfused red blood cells is hemolyzed, and since a relatively larger portion of the serum proteins disappear from the circulating blood, much more blood has to be supplied than seems necessary on the basis of the hemoglobin percentage and the serum protein concentration found. —*Samuel Kahn, M.D.*

Cardiovascular and Blood Volume Alterations Resulting from Intrajejunal Administration of Hypertonic Solutions to Gastrectomized Patients; The Relationship of These Changes to the Dumping Syndrome. KATHLEEN E. ROBERTS, HENRY T. RANDALL, HOLLON W. FARR, ALLYN P. KIDWELL, and Others. *Ann. Surg.*, 1954, 140: 631.

THE INTRAJEJUNAL administration of hypertonic solutions or starch causes an acute decrease in circulating blood volume resulting from a shift of plasma water into the intestinal lumen. The shift of fluid into the intestinal tract is mediated by differences in osmolarity between the administered solution and the plasma.

Electrocardiographic alterations and symptomatology typical of the dumping syndrome occur coincidental with the decrease in blood volume. Similar alterations did not occur in patients with intact stomachs who were given equivalent amounts of hypertonic solution.

It is suggested that the acute drop in blood volume with subsequent stimulation of pressoreceptors intimately associated with regulation of arterial blood pressure is implicated in the sympathetic component of the dumping syndrome.—*Ely Elliott Lazarus, M.D.*

The Reaction of the Total Circulating Serum Protein to Gastrectomy. BJARNE FRETHEIM. *Acta. chir. scand.*, 1954, 108: 135.

AFTER SUBTOTAL GASTRECTOMY for ulcer, in which the blood loss has not been compensated for by trans-

fusions, and the patients have been receiving standard postoperative treatment with fluids, the hemoglobin percentage, the total hemoglobin, the blood volume, the red cell and plasma volume, the serum protein concentration, and the total circulating serum protein show a postoperative fall.

The loss of blood during subtotal gastrectomy and in the following 24 hours is much greater than the loss of blood measured by the weighing of compresses and by measuring the blood in the suction flask. The blood volume falls to the lowest level 24 hours after the operation, and then rapidly increases during the following days. Though the plasma volume also falls to its lowest level during the first 24 hours, the fall is relatively less; on the seventh postoperative day, it is even higher than it was preoperatively.

The total circulating serum protein also falls to its lowest value after 24 hours, and then regularly increases. On the seventh postoperative day, it is still lower than it was preoperatively, though it has increased relatively more than the total hemoglobin and the red cell volume.

The result of these changes is that the hemoglobin percentage and the serum protein concentration fall to their lowest values on the fourth postoperative day, before beginning to increase. The hemoglobin percentage and the serum protein concentration during the first three postoperative days are not commensurate with the amount of blood lost; nor can they be accepted as good indicators of the need for blood replacement, which should be begun when the loss of blood occurs, and not several days later.

The fall in serum protein is relatively less than is the fall in hemoglobin, due either to the replacement of proteins from "depots", or to the more rapid production of serum protein than of hemoglobin.

In subtotal gastrectomy with splenectomy, a similar but more marked reaction occurs. In such cases, there is a relatively greater fall in plasma values than in red cell volume, and a relatively greater fall in total circulating serum protein than in total hemoglobin. By giving macrodex in addition to blood, it is possible to prevent the fall in plasma volume; consequently, the fall in blood volume is less pronounced.

The loss of blood during a gastrectomy is much greater than the loss measured during the operation. Because of this, less blood is given by transfusion than is needed to compensate for the blood lost.

—*Samuel Kahn, M.D.*

Reflections on Regional Ileitis, 20 Years Later. Burrill B. Crohn and Henry D. Janowitz. *J. Am. M. Ass.*, 1954, 156: 1221.

Since the original description of regional ileitis, 20 years ago, the general concept of the disease from a clinical and pathologic standpoint has been established. Little has been amended as to the symptoms, complications, fistulas, and course; however the pathologic changes noted, although singular and discrete, are less convincing of an entity. Innumerable terms have been suggested to cover the clinical and pathologic finding of this disease; the most general term applicable is regional enteritis.

It is apparent that the frequency is increasing, as evidenced by the vast increase in the number of reports and the compilation of over 1,500 cases from three major sources. The etiology is unknown; therefore many avenues of speculation have been carried out. The familial history which obtained in some patients cannot be seriously considered. Chronic granulomatous diseases, particularly tuberculosis, seem well ruled out, as does the likelihood of sarcoidosis. Allergic factors have been favored by some investigators; yet, this etiology also seems unlikely. A disease similar to regional enteritis has been reported in Denmark in swine. No positive agent has been incriminated in this disease. In contradistinction to ulcerative colitis, emotional stresses do not seem to be a major precipitating factor in regional enteritis.

The central pathologic feature of the disease is lymphangiectasis or granulomatous lymphatic involvement. A similar picture can be produced in animals by the ingestion of finely divided silicates or injection of the abdominal lymphatics by sclerosing substances. Since the products of lipolysis produce a similar tissue reaction, the English authors have favored a local disturbance in fat metabolism or fat absorption as being involved in the production reaction of regional enteritis. A similar speculation would indicate that a noxious agent present in the intestinal stream is either being concentrated or absorbed by the lymphatics, thus producing the regional ileitis.

The essential pathologic features of localized submucosal lymphoid hyperplasia, a noncaseating tuberclelike reaction, fibrosis, and the tendency towards repair have been further documented throughout the passage of time. Although a considerable amount of speculation has been presented concerning the similarity between ulcerative colitis and regional enteritis, it would appear that these are separate entities.

The clinical aspects have been little changed with the passage of time; however, certain features deserve comment. The disease apparently is independent of age, sex, social or economic factors, and geographic location. The relationship between acute terminal ileitis, which is seen in children, and the regional enteritis has not been resolved. In the original description the great tendency toward both internal and external fistula formation was pointed out; in recent years it appears that the presence of abdominal wall fistulas is decreasing, and probably represents the recognition of the disease and the general tendency toward not removing the appendix. More recently, the high incidence and diagnostic significance of perianal or perirectal abcesses and fistulas has become apparent. The occurrence of pregnancy in a patient with regional enteritis does not tend to impair the pregnancy nor does the disease flare up following delivery.

The major addition to the knowledge of the clinical features of regional enteritis has been the recognition that this granulomatous process may occur not only in the terminal ileum but also in the jejunum, colon, duodenum, and occasionally in the stomach. In accordance with this increase in the distribution pattern of this disease there is a widening of basic clinical features which in turn depend upon the site of the involvement. In spite of this, the most common site of localization of the disease is in the terminal ileum, and

a majority of recurrences after either short-circuiting or resection operations present in the new terminal ileum regardless of the interval of time that has elapsed. Extension into the small intestine from granulomatous disease involving the colon is rare and does not tend to occur in the absence of operation. Approximately 5 per cent of patients with ileitis have associated chronic ulcerative colitis. The so-called combined form may originate as ileitis and later manifest the phase of ulcerative colitis. Apparently typical ileitis or ileojejunitis may develop in some patients with ulcerative colitis after permanent ileostomy and colectomy.

There are wide gaps in the knowledge of the natural history of untreated regional enteritis. The disease may be noted incidentally in asymtomatic patients. There may be roentgenologic evidence of recurrent disease even though the patient has been asymptomatic, and in some patients there are spontaneous remissions. There is evidence that healing potentially is present and occurs by fibrotic replacement and the development of stenotic scarred areas after bypass operation. Further information is of fundamental importance in assessing the value of any proposed therapeutic regimen.

The chief diagnostic tool is a roentgenographic study by means of a barium enema and a barium meal. The typical findings are the classical string sign, blunting and thickening of the mucosal fold, cobblestoning reticulation, and late rigidity. At operation, the findings are usually diagnostic.

Medical therapy for regional enteritis is nonspecific and consists of the usual supportive measures. Administration of intestinal sulfa compounds has a place in the management of external fistulas and the control of secondary bacterial invaders in the intestinal tract. The initial responses obtained with corticotrophin and cortisone have been disappointing.

Surgical treatment has some merit, even though the rate of recurrence is increasing. In the groups which were treated by ileocolectomy and exclusion of the ileum, a recurrence rate as high as 22.8 per cent has been reported. The rate of recurrence in patients treated by resection is even higher. These high early recurrence rates, coupled with the fact that recurrence may appear as late as 19 to 24 years after the primary operation dictate that the indications for operations be reformulated. The detection of the lesion roentgenographically is not of itself an indication for surgery. The complications which are considered as indications for surgical therapy are cicatrizing stenosis with obstruction, multiple fistulas, and a large, tender, inflammatory mass.

The timing of the operation is also important. It is a general feeling that, if possible, operation should not be performed until the pathologic process appears to be burned out or approaching the fibrotic sclerotic stage. A rapidly progressing disease state with deterioration of the patient may indicate the need for early operation. The controversy of ileocolostomy with exclusion of the segment of the involved intestine versus resection of this segment is still not settled. It should be remembered, however, that the short-circuiting procedure does tend to heal the excluded loops of the diseased small intestine. Although surgery may be considered only as pallative treatment, any operation followed by recurrence in some cases only after 10 to 20 years still has considerable merit.

Regional ileitis is a pathologic and clinical entity. The recognition of granulomatous cicatrizing lesions found in all areas of the small intestine and colon has broadened the concept of the disease. The characteristic pathologic process, particularly the local lymphatic involvement, has been clearly established. The interrelationships of regional ileitis and chronic ulcerative colitis is not clear. There is an inordinate rate of recurrence of ileitis following operative procedures directed toward cure. The present trend of thought is to defer operation until the pathologic process appears to be quiescent and then perform surgery only for the complications of the disease.

—Jerry A. Stirman, M.D.

A Review of Duodenal Diverticula (Considerazioni su alcuni casi di diverticoli e pseudodiverticoli duodenali). GIOVANNI D'ERRICO. *Gior. ital. chir.*, 1954, 10: 687.

THE AUTHORS review the classification, etiology, diagnosis, and treatment of duodenal diverticula and present 6 case histories in which 4 patients had true diverticula and 2 had false or pseudodiverticula.

In the group with true diverticula, the first patient had severe hematemesis and melena, the second one presented symptoms of duodenal ulcer, the third had vague epigastric distress and melena, and the fourth had severe colicky abdominal pains. In the group of false diverticula the first patient had a traction diverticulum due to periduodenal adhesions associated with a chronic cholecystitis, and the second, at exploration, was found to have a calcified preaortic node which had been mistaken, on preoperative roentgenologic examination, for a diverticulum.

In the group with true diverticula, one was operated on and had a resection of the diverticulum with an uneventful postoperative course. In one patient with pseudodiverticulum, the symptoms disappeared after cholecystectomy and lysis of the periduodenal adhesions. The authors believe that true duodenal diverticula are more frequent than is commonly thought, that if symptomatic they should be operated on, and that the most difficult part of the operation is to find the diverticulum. For this reason they advise that careful mobilization of the duodenum be carried out at the time of exploration for diverticulum and, if possible, excision. *—Alexander J. Conte, M.D.*

Reflections on the Surgical Treatment of Duodenal Ulcer. JAMES T. PRIESTLEY. *Arch. Surg.*, 1954, 69: 455.

THE MEDICAL LITERATURE of today includes many fine reports of objective observations on varied experimental studies or detailed data concerning some facet of clinical investigation of the surgical patient. Such reports are essential but they may fail to express the broad views of the author regarding the particular problem under study. The author has presented a few general remarks, without benefit of statistical data or experimental observations, on the surgical care of the patient who has a chronic duodenal ulcer.

He and his associates operate on only 10 to 15 per cent of the patients whom they see with duodenal

ulcer. Medical management is instituted in the remainder.

There are many variables evidenced by the patient who has a duodenal ulcer. Likewise, there are variables in the surgical procedures that can be performed. It therefore seems appropriate that the variables presented by the patient should be considered in each case in relationship with the type of surgical procedure best suited for the individual patient. Some of these variables which the patient manifests are evident prior to the time of operation and others only after the abdomen is opened.

Speaking first of those which are apparent upon examination of the patient, an excellent discussion of one aspect of this subject which deals with weight of the patient has been presented by Zollinger. It seems perhaps that in this country surgeons have been guided, in the selection of operation for the patient with duodenal ulcer, too completely by the incidence of recurrent ulceration. Probably the postoperative functional result and nutritional status of the patient should receive more consideration. In addition to considering the preoperative weight of the patient the author considers the patient's normal appetite and whether or not he is a "good eater" when healthy. If so, he may well continue in the same habits after a partial gastrectomy. However, if he has never had a very large desire or capacity for food, these characteristics may well become accentuated after a major portion of the stomach is resected.

There appears to be a place for high gastric resection, associated with bilateral vagotomy, as a primary procedure for the young man in his twenties, perhaps with a strong family history of duodenal ulcer, who has severe symptoms which are difficult to control at best for more than a few months at a time, extremely high values for gastric acids, and an obviously large neurogenic element in his disease. It has been learned that this type of person is a fine prospect for recurrent ulceration after any "ordinary" type of operation has been performed for duodenal ulcer. Vagotomy combined with high gastric resection offers maximal protection.

At the time the complete paper was written the author's preference in surgical treatment of the patient who has duodenal ulcer was for partial gastrectomy (75 per cent) and severing the duodenum distal to the ulcer, and establishing a posterior Hofmeister-Polya type of anastomosis.

If gastric resection is performed for duodenal ulcer, the most important consideration in the prevention of recurrent ulceration is removal of an "adequate" amount of stomach. However, what is adequate for one person may not be adequate for another. It is generally stated that two-thirds to three-quarters of the stomach should be removed, with the preponderant opinion favoring the larger of the two amounts. It is difficult for the surgeon to estimate accurately the percentage of the stomach resected, although weight, surface area, and other measurements may be used for this purpose. For some years the author and his associates have used a formula developed by Heinrich which is dependent on weight of the resected portion of the stomach divided by thickness of the muscularis at the upper edge of the resected portion of stomach. This method appears to afford rather accurate estimates in the majority of cases.

The type of anastomosis that is established may influence the incidence of postoperative complications and dumping symptoms, as well as the motor function and nutritional status of the patient.

Opinions differ regarding the early and late postoperative care of patients who have had an operation for duodenal ulcer. One of the first considerations which arises is whether an indwelling tube should be left in the stomach upon completion of the operation. It appears preferable not to penalize every patient by the routine use of postoperative gastric suction but to use this type of treatment only for the patient who actually needs it. In the author's experience, this need is quite uncommon and may be indicated by a sensation of epigastric fullness, hiccup, nausea or vomiting. If any of these symptoms develop, a tube may be passed into the stomach and permitted to remain or not, depending on the amount of gas or fluid aspirated from the stomach and the relief which is afforded the patient.

The situation appears to be different if a vagotomy has been performed—whether this is done in association with a gastroenterostomy, a gastric resection, or by itself, perhaps for jejunal ulcer after a previously performed gastric resection. It is the author's practice, however, to insert an indwelling gastric tube in all patients who have undergone vagotomy. Mild suction is applied constantly for the first 24 hours. After this period, only intermittent suction is used, perhaps 1 hour out of each 3 or 4 hours. As soon as it is demonstrated in this manner that the stomach is emptying satisfactorily, the tube is withdrawn. This is usually done 48 to 72 hours after operation.

The postoperative feeding program of the patient who has undergone a partial gastrectomy for duodenal ulcer is a matter of great importance. Consideration of this program may be divided into the early and late postoperative periods. Oral administration of fluids is now usually started during the second 24 hours after operation. Subsequently, a graduated diet of increasing caloric content is given so that by the end of the first week after operation the patient is taking by mouth an adequate normal caloric intake. This is arranged in the form of three main meals a day with only small feedings between meals.

According to the author, the important points to be emphasized to the patient during the second week after operation are that his stomach is smaller than it used to be and that it is natural for him to experience some fullness after eating a fair-sized meal. He should be encouraged to "work towards" eating three regular meals of normal size each day. If he "gives in" to this sense of fullness and eats so little at one time that this sensation is not experienced, he will gradually eat less and less at one time, lose weight and strength, and be generally unhappy. The patient should not be dismissed until he is eating in a satisfactory manner. If he is dismissed previously, a serious nutritional problem may develop and become increasingly difficult to correct with the passage of time. In brief, it is the responsibility of the surgeon not only to cure the patient of his ulcer disease but also to see that he has a satisfactory functional result after the operation.

In most instances a prolonged postoperative medical program after operation seems undesirable and unnecessary.

Chronic Ulcerative Colitis; Early and Late Experiences of 124 Patients with Ileac Stomas. ARNOLD G. ROGERS, J. ARNOLD BARGEN, and B. MARDEN BLACK. *Gastroenterology*, 1954, 27: 383.

IT HAS FREQUENTLY been demonstrated that the making of an ileac stoma by itself is not a cure of chronic ulcerative colitis. It has been pointed out repeatedly that the stoma itself leads to difficulties in many cases, that the mortality associated with such therapy is high, particularly in the case of fulminating disease, and that the stoma, once made, is usually a lifelong affair.

The present report is based on a review of experiences with ileac stomas at the Mayo Clinic for the decade of 1940 through 1949. The purpose was to determine the fate of a large group of patients with chronic ulcerative colitis treated by ileostomy. Both the immediate and late mortality and morbidity were determined. The dangers and complications of life with a stoma were investigated. According to the authors, the results of the review afford substantial support to their belief that ileostomy should be done only for definitely prescribed conditions, and only for well established indications.

During the period mentioned, 124 patients with chronic ulcerative colitis were treated by ileostomy at the Clinic. This was about 5 per cent of all patients seen with chronic ulcerative colitis.

The mean age at the time of operation was 34.3 years for males and 32.2 years for females. The mean duration of disease was 8.7 years for males, and 10.1 years for females. The mean values for weight loss, hemoglobin concentration, and sedimentation rates were described for patients without carcinoma. No significant difference was found for patients with carcinoma of the colon.

The indications for surgical treatment were generally multiple. At operation, 94 single or double-barreled stomas were made; 30 skin-grafted stomas were made after 1945. Seventy-three per cent of the group had further surgical treatment. In addition to ileostomy, the mean number of operations was 2.5. Subtotal colectomy was done in 55 per cent and abdominoperineal resection in 35 per cent of all patients.

After ileostomy alone, the weight and the values for hemoglobin generally were restored to normal within 1 year in patients without carcinoma. Obesity occurred in 23 per cent of patients after ileostomy alone, and in about 40 per cent of those that underwent colectomy also. In 41 per cent of patients, symptoms of active colitis continued after the stoma was made.

The mortality rate in the group of patients having ileostomy was 46 per cent, determined on the basis of all deaths that had occurred by 1952. Peritonitis was the cause of 22 of the 36 deaths occurring after operation. The last year covered by the study, 1949, saw no hospital deaths after ileostomy alone.

Severe hemorrhage, enteritis, obstruction of the bowel, and psychologic handicap were among the more serious and frequent complications. The local complications associated with the stoma—prolapse, stenosis, and fistula—required surgical revision in 38 per cent of the patients with ordinary stomas, and in 33 per cent of those with skin-grafted stomas. Prolapse was more frequent with the ordinary stoma; stenosis was more frequent with the skin-grafted stomas. Causes in addition to prolapse, stenosis, and fistula brought to 43 per cent the proportion of patients who required revision of the stoma. Only 14 per cent of the original group of patients lived more than 1 year without serious complications. The evidence indicated that any complication can occur at any time after establishment of the stoma.

The indications for ileostomy and colectomy fall into three groups: first and more frequent are the local sequelae of disease in the colon; second, systemic causes; and third, chronic invalidism (rarely). Because of the complications and mortality occurring after ileostomy and colectomy, the surgical therapy of chronic ulcerative colitis should be reserved for those patients with the indications described.

Surgical Treatment of Cancer of the Rectum by the "Combined Synchronized" Operation (Le traitement chirurgical du cancer du rectum par opération synchronisée à deux équipes). J. COFFÉ, P. COGNIAUX, and M. VIGONI. *Acta chir. belg.*, 1954, 53: 484.

AMONG THE 113 CASES REPORTED in this series there were 110 adenocarcinomas, 2 colloid carcinomas, and 1 epithelioma. Four patients had 2 separate cancers each, 11 had carcinomas formed on the basis of a polyp, and 9 showed a cancer coexisting with 1 or more microscopically benign polyps.

Local therapy was carried out in 12 patients, 7 of whom were subjected to ablation of the polyps because of cancerous degeneration, 2 because of poor general condition, and 3 because of low situated, stenosing, inoperable cancers, or because they had refused surgery and underwent fulguration under sigmoidoscopy.

In all, there were 86 radical operations, 19 abdominal resections (called "anterior"), 20 Babcock-Bacon and 47 abdominoperineal resections, with a mortality rate of 8.1 per cent. Among the 19 patients operated on by the "anterior" method, there were 11 curative and 8 palliative operations with 1 postoperative death in each group. The 3 patients operated on by Swanson's method were included in this group. It seemed undeniable to the authors that this technique, more than others, favored local recurrences not because of incomplete tumor removal but rather because of local implantation at the level of the suture. This view has also been expressed in the literature. However, in patients with liver metastases this procedure is recommended.

There was no operative mortality in 47 patients operated on by the abdominoperineal route. There were 20 patients operated on by the Babcock-Bacon method with 5 immediate postoperative and 5 delayed deaths. Nevertheless, the authors were convinced of the value of this operation as it permitted "sufficient" conservation of sphincter function in 60 per cent and "excellent" conservation in 30 per cent of the patients, which conservation was not obtainable with any other similar procedure.

The advantages claimed for the "combined synchronized" technique included: improved technique, easier identification of the structure, reduction of operative shock, a more complete operation with fewer postoperative accidents, and improved morale of the participating surgeons.

—*Sidney Smedresman, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

Experimental Study on the Collateral Circulations After Ligation of the Hepatic Artery (Ricerche sperimentali sul circolo collaterale dopo legatura dell'arteria epatica). CONSTANTE BANDIERA. *Arch. ital. chir.*, 1954, 77: 437.

THE AUTHOR presents an anatomic and roentgenologic study on the collateral circulation following ligation of the hepatic artery, with the dog as the experimental animal.

The close analogy of the celiac axis in the human being and the dog is described and compared. In the dog the celiac axis divides into two trunks, namely, the hepatic and the common gastrosplenic artery which in turn divides into the left gastric and splenic artery, with distribution very much like that in man. The diaphragmatic arteries in the dog emerge singly from the aorta, below the anterior mesenteric artery. These phrenic arteries may arise from the lumbar arteries or even from the renal arteries or any combination thereof. The phrenics anastomose with the intercostal arteries, first lumbar artery, and with the superior and inferior epigastric arteries. Other branches go to the capsule of the liver, suspensory ligaments of the liver, the esophagus, and to the stomach. Therefore, there is an anastomosis between the phrenic, the left gastric, and the hepatic arteries. The anterior mesenteric artery in the dog gives rise to the inferior pancreaticoduodenal artery, which anastomoses with the superior pancreaticoduodenal artery of the hepatic artery.

The method of study was as follows:

Two groups of animals were used: (a) in the first group the animals were operated on and various arteries of the gastrohepatic complex were ligated. The animals were sacrificed and then their thoracic aorta was injected with dye, following which they were x-rayed, and studied by anatomic dissection. In the second group these arteries were similarly ligated but the animals were allowed to live for varying periods of time to establish a collateral circulation. Then they were sacrificed and studied as in the first group.

First Group

1. Ligation of hepatic artery just distal to its origin. The entire vascular supply to the viscera, including the liver, spleen, and pancreas, remained outlined with the dye. The hepatic artery was visualized with dye, proximal as well as distal to the ligature. The anastomotic arterial pathways were also visualized. Of interest were the arterial communications between the diaphragmatic branches which penetrated the ligaments of the liver and the liver proper.

2. Ligation of the hepatic and splenic arteries distal to their origin. Again all of the viscera were outlined as well as the entire vascular tree of the viscera. The dye was also visualized distal as well as proximal to the ligated blood vessels. The collateral supply was probably established via the left gastric artery and the inferior pancreaticoduodenal artery.

3. Ligation of the hepatic and left gastric artery. Again all branches of the celiac complex and viscera were visualized and each ligated artery was visualized both proximal and distal to the ligatures. The collateral supply was apparently established by the splenic artery (left gastroepiploic) and the anterior mesenteric artery.

4. Ligation of the gastrosplenic trunk. There was the same visualization as before, with the collateral circulation being established by the hepatic artery and pancreaticoduodenal artery.

5. Ligation of the celiac trunk. Again the same visualization as previously, with the collateral circulation being established via the pancreaticoduodenal artery.

6. Ligation of the celiac trunk and the anterior mesenteric artery. In this instance the first difference in visualization of the vascular supply of the organs supplied by these arteries was observed. None of the organs, that is, the liver, spleen, stomach, or their vascular supply was outlined. Only the inferior diaphragmatic artery was outlined.

7. Ligation of the hepatic artery and all of its branches. The vascular supply to the stomach, duodenum, pancreas, and spleen was outlined. However, only the hepatic artery, proximal to the ligature was outlined, while the gastroduodenal artery and the pyloric artery were outlined distal to their respective ties. The common hepatic, the diaphragmatic, and the periportal arteries were not injected with the dye.

The rich anastomosis via the gastroduodenal artery and the anterior mesenteric artery produced an adequate collateral circulation following ligation of the hepatic artery.

Second Group

At autopsy the ligated arteries were found to be occluded over a distance of approximately 0.5 cm.,and the viscera and parietes were the site of numerous adhesions and sclerosing scars. The arteries were never found to be recanalized, and there were never any direct anastomotic channels established between the proximal and distal (to the ligature) sections of the vessels.

Frequently dense adhesions were evident between various abdominal viscera, such as the liver and stomach, liver and anterior abdominal wall, and spleen and stomach. The type of adhesions were never characteristic of any particular blood vessel ligated. It is both interesting and significant that within the adhesions themselves there could be found newly formed collateral arterial channels, sometimes voluminous, which penetrated the organs and could be traced and outlined. This was true especially of those vessels penetrating the capsule of the liver.

1. Ligation of the common hepatic artery. Three dogs were so studied and all survived for varying periods of time. The collateral circulation was established via the left gastric, splenic, and anterior mesenteric arteries. Of interest was the increased size and tortuosity of the inferior phrenic artery, and the newly formed vessels in the adhesions which penetrated the

liver parenchyma, as well as the newly formed vessels within the gastrohepatic ligament.

2. Ligation of hepatic and splenic arteries. Seven dogs were so treated, 2 of which were treated with penicillin and survived until sacrificed; the other 4 died at varying intervals. The collateral circulation was found to be established in these dogs, both on x-ray examination and at autopsy, via the left gastric and the anterior mesenteric arteries, with complete outlining of the vascular tree, as well as outlining of the hepatic artery, both proximal and distal to the ligature.

3. Ligation of the gastrosplenic trunk. Two dogs were so treated and given penicillin until sacrificed. In these dogs there were dense adhesions between the stomach and spleen, and the gastrohepatic ligament appeared to be normal. There was complete outlining of the vascular tree in these animals.

4. Ligation of the celiac trunk. One dog was so treated and given penicillin at the same time, he survived until sacrificed. There were adhesions between the inferior surface of the liver and the stomach. The collateral circulation was established via the inferior pancreaticoduodenal artery, which was greatly enlarged. The inferior phrenic arteries and the periportal branches were also enlarged and more tortuous.

5. Ligation of the hepatic artery and all of its branches. Three dogs were so treated and aureomycin was given to each dog. Only 1 dog died before being sacrificed. The hepatic artery appeared as a fibrous cord, partially obliterated, and there were numerous adhesions present. The gallbladder appeared somewhat atrophied. Within the adhesions there were numerous newly formed blood vessels, of various caliber, many of which penetrated the under surface of the liver, its capsule, and the parenchyma. The inferior phrenic arteries were increased in size, and at the level of the diaphragm they anastomosed with the superior phrenic arteries, the branches of which could be followed to the pericardium. The esophageal arteries were also demonstrable above the diaphragm.

These investigators believe that it is dangerous to ligate the hepatic artery distal to the pyloric artery and the gastroduodenal artery because the blood supply to the liver is compromised. On the other hand, ligation of the hepatic artery close to its origin does not present this danger. The role of antibiotics in preventing liver damage following hepatic artery occlusion is well recognized and stressed. These studies indicate the adequate collateral circulation following ligation of the hepatic artery, and the various collateral channels which may be established following this ligation. —*Frank O. Franco, M.D.*

The Main Cholanic Acids of Human Bile from Normal Gallbladder and from Gallbladder Associated with Cholesterol Stones. BJÖRN ISAKSSON. *Acta Soc. med. Upsaliensis*, 1954, 59: 307.

IT HAS BEEN SHOWN that a system of desoxycholic acid and lecithin has a greater cholesterol dissolving capacity than a system of cholic acid and lecithin. It has not yet been possible, however, to test chenodesoxycholic acid in that respect.

The necessary determinations were performed on bile samples from 18 normal (7 females and 11 males) and 28 pathologic (22 females and 6 males) subjects who were available for examination.

The amounts of cholic acid, chenodesoxycholic acid, and desoxycholic acid were determined by specific colorimetric methods. In normal bile, cholic acid and chenodesoxycholic acid appear in nearly the same amounts, while desoxycholic acid forms only a minor fraction. In pathologic bile the amount of chenodesoxycholic acid seems to be decreased; cholic acid is possibly lowered in the males.

Cholic acid seems to participate to a greater extent in the formation of the cholesterol-dissolving lecithin-bile system than the other two bile acids.

—*Stephen A. Zieman, M.D.*

Traumatic Rupture of the Normal Spleen; Experimental Study Concerning the Mechanics of Its Genesis (Die traumatische Ruptur der normalen Milz; eine experimentelle Studie zur Mechanik ihrer Entstehung). WOLFGANG KÖLE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 345.

INJURIES OF THE SPLEEN, which form 20 per cent of all traumas of parenchymatous organs of the abdomen, can be subdivided into open and closed wounds. This article deals only with the last mentioned type.

The spleen parenchyma may rupture without an accompanying lesion of the capsule, and vice versa. The term "one stage rupture" is applied to a concurrent laceration of the capsule and parenchyma while the term "true two stage rupture" implies that a laceration of the capsule was subsequent to the injury of the parenchyma. The author uses the term "spurious two stage rupture" to describe a simultaneous rupture of the spleen and its capsule, followed by a secondary hemorrhage. A rupture of the spleen alone or its capsule alone is very rare. The one stage rupture is much more frequent than the true two stage variety.

Of 19 cases of rupture of the spleen reported by the author, 16 were closed and 3 were of the open type. Eleven were one-stage ruptures, 4 were true two-stage ruptures, and 1 was a spurious two-stage laceration.

Mechanical factors responsible for injury of the spleen were studied by the authors on organs removed at autopsies.

Saline solution was injected under the capsule in 10 organs. In no instance did the capsule tear. An amount exceeding 135 c.c. could not be introduced without leakage around the needle. It is assumed that a subcapsular hematoma may exceed this amount if the capsule is intact.

In the second series of experiments a blow with a fist was applied in various directions to 30 normal spleens wrapped in a towel, cotton, and cellucotton. It was found that the location and depth of laceration depended to a great extent on the direction and intensity of the blow. However, in nearly every instance a transverse rupture resulted. The findings correspond to those in patients in whom the ratio of transverse to longitudinal lacerations was 15 to 1.

In the third series of experiments, strips of the splenic capsule, 1 cm. wide, were suspended and weights were attached to them until a rupture occurred. It was found that the resistance of the capsule in transverse direction was 3 times as strong as that in longitudinal direction. —*Joseph K. Narat, M.D.*

MISCELLANEOUS

Closed Abdominal Injuries. RUSCOE CLARKE. *Lancet*, Lond., 1954, 2: 877.

AN ACCURATE anatomic preoperative diagnosis is often not possible in cases of closed abdominal injuries, since the damage is frequently widespread. The problem of diagnosis is further complicated by the high incidence of concomitant injuries to other areas of the body.

The surgeons of the Birmingham Accident Hospital, Birmingham, England, have adopted the policy of early operation in cases of suspected intra-abdominal injury; "mere suspicion must remain pre-eminently the basis for laparotomy." They do not wait for unequivocal signs since serious abdominal injuries may be present with no abdominal signs or symptoms. In the period from 1947 to 1953, 107 patients were operated upon for closed abdominal injuries. In 12 of these, no obvious explanation for signs or symptoms was found on laparotomy. During this same period, approximately 300 patients with suspected abdominal injuries were treated without surgery. Thirteen patients died without surgery.

There were 24 deaths among the 107 patients treated by laparotomy. The majority of the deaths were attributable to associated injuries elsewhere. None of the 12 patients with negative explorations died. Of the 13 patients dying without operation, only 1 might have been saved by early surgery. The remainder were either moribund on admission or died of other injuries.

Injuries encountered at operation involved, either singly or in combination, the kidneys, spleen, liver, pancreas, all levels of the gastrointestinal tract, mesenteries, and blood vessels. It is interesting that there were 2 instances of rupture of the bowel within a hernia. The widespread nature of the injuries emphasizes the necessity for an incision adequate for thorough visualization as well as for palpation of all the recesses to the abdominal cavity. The author recommends delivery of the spleen into the wound in cases of rupture as the best way of arresting hemorrhage rapidly. Evisceration of the entire small bowel is helpful in exposing bleeding sites. He prefers the transabdominal approach in suspected injuries of the kidney since the pedicle can be easily controlled and further intra-abdominal injury will be disclosed.

In addition to early exploration, full use was made of replacement of blood loss, antibiotics, and refinements of postoperative care. The avoidable death of only 1 patient in the group which was not explored, and a zero mortality in the group of unnecessary explorations justify the author's plea for early operation on suspicion of closed abdominal injury.

—Lockert B. Mason, M.D.

GYNECOLOGY

UTERUS

The Radiobiologic Fundamentals Concerned in the Application of the Grid in the Roentgen Therapy of Carcinoma of the Uterine Cervix in an Advanced Stage (Fondamenti radiobiologici per l'applicazione delle griglie nella radioterapia del carcinoma del collo uterino in stadio avanzato). FRANCO BISTOLFI and MINO BOLOGNESI. *Ann. ostet. gin.*, 1954, 76: 214.

TWO POINTS of superiority of this method over the conventional, and even the newer, methods of irradiation therapy for epithelioma are claimed by the authors. The first advantage of the method lies in the fact that the alternate areas of opacity (under the strips of metal of the grid) and of permeability (between these strips) permit a much heavier dosage of the ray, since recovery takes place across the permeable areas from the impermeable areas on each side, and not from the edges of a broad field of irradiated surface, as with the conventional method.

The second advantage lies in the fact that the connective tissue stroma of the tumor and the surrounding connective tissues are not impeded in their function (antineoplastic action) of choking off and phagocytizing the remnants of the parenchymatous (epithelial component) portion of the tumor. In fact these elements seem stimulated rather than injured by the grid method of irradiation therapy.

These ideas are not entirely new; the method, the results (4 year survivals) to be expected, and the theories involved have already been adequately discussed in the English language (Jolles, B.: X-Ray Sieve Therapy in Cancer; A Connective Tissue Problem. London: 1953, *H. Lewis & Co.*). However, Jolles was concerned with superficial (skin and mucosae) cancer and here the authors are concerned with advanced stages of cervical cancer.

The problem faced by the authors differs somewhat from that of Jolles in that the areas, or tumor masses (pelvic infiltrations and pelvic lymph gland metastases) are much more deeply located and therefore the alternate areas of shielding and exposure are much harder to maintain, since, as Jolles shows, the irradiation effects tend to become more homogeneous as the distance from the grid is increased. Thus the method is more easily applied and is more effective in thin individuals than in those who are more obese. To provide the so-called nonhomogeneity in irradiation effects for these more robustly built individuals, a bigger grid with a coarser grid structure is required.

Thus the so-called fractionation in space represented by this method of irradiation therapy renders less imminent the need for fractionation in time, and the patient can be irradiated daily. In the opinion of the authors, this represents a more generally effective method, and, together with the stimulation, rather than corrosive effects, permits of the irradiation of conditions considered unsuitable for the conventional method. Thus they do not hesitate to irradiate tissues which have already been subjected to roentgen and radium irradiation (postsurgical recurrences of pelvic lesions, postirradiation conditions, and carcinoma of the residual cervical stump).

Unfortunately the results cited must be borrowed from such writers as Jolles, since the authors' own material is not sufficiently extensive (some dozens of cases) nor sufficiently tested by time to permit of inclusion in the present report. Such material will be published in a subsequent article now in the course of preparation. —*John W. Brennan, M.D.*

Advances in the Control of Radium Therapy for Cervical Cancer. GEORGE C. LEWIS, JR., and FRANKLIN L. PAYNE. *Surg. Clin. N. America*, 1954, 34: 1671.

Progressive developments in the field of radiation therapy since its first introduction have changed its management from indefinite terms to those which more specifically express dosage in tissues. This alteration has resulted from a greater knowledge of the anatomy of tumor spread, the physics of radiation, and the physiology of tissue response to irradiation.

Findings have indicated the origin of cervical malignancy to be at or near the squamocolumnar junction, and the spread to be through the parametrium to the subsidiary nodes. The potential avenues of spread must be considered as a volume in which the therapy has to be directed accurately, especially in regard to radium with its limited zone of effective radiation and its hazards for normal tissues.

Attempts to control radium application have followed three general methods: (1) the use of standard isodose patterns, (2) the use of roentgenography, (3) the insertion of ionization measurement devices into the rectum, bladder, or the peritoneal cavity with radium in situ.

Standard isodose patterns are useful in comparing ideal applications by different methods. Individual dosage levels are not indicated unless additional studies are performed to determine the anatomic variations of the patient. Roentgenography can be used to visualize radium element positioning or accurately to reconstruct the location of the radium and the contiguous structures outlined by radiopaque media. The former application of roentgenography permits the correction of gross misplacement, while the latter, usually a variation of a standard pelvimetry technique, enables the therapist to determine accurately the distribution of irradiation. The best methods require a great deal of knowledge of physical and operative techniques. They frequently prove to be time consuming.

Ionization measurement has been done by condenser chambers and scintillation probes inserted into a hollow viscus. These direct reading measurements provide simple and rapid determinations of dosage levels. The methods do require specialized knowledge for calibration and operation of the equipment.

The control of the total amount of therapy delivered in a given time period depends upon normal tissue tolerance and effective dosage ranges for malignant cells. Although limiting values have been postulated by several authors there are still no established figures

based upon a significant number of individualized determinations.

The combined application of isodose patterns, radiography, and ionization measurement should provide more information about controlled dosage and its relationship to tumor destruction and normal tissue preservation. —*George C. Lewis, Jr., M.D.*

EXTERNAL GENITALIA

Results of a Planned Attack on Carcinoma of the Vulva. STANLEY WAY. *Brit. M. J.*, 1954, 2: 780.

OWING to the comparative rarity of carcinoma of the vulva few people see sufficient cases to become very familiar with the problems concerned in its treatment.

Investigations by the author showed that the poor results obtained were due to unsound pathologic and anatomic principles. The removal of the vulva was insufficiently wide and the node dissections were not extensive enough. As a result of this study he devised, and has previously described, an extended radical vulvectomy and node dissection.

From 1943 onwards, all cases of carcinoma of the vulva seen in a wide geographical area were referred to the author for surgery. The results of the treatment of 79 patients from 1943 to 1949 are reviewed.

One patient refused treatment and 13 were considered unfit. The operability rate was 83 per cent. The absolute 5 year survival rate was 61 per cent and the relative 5 year survival rate—that is, the survival of all patients operated upon—was 74 per cent. When the lymph nodes were involved the 5 year survival rate was 48 per cent and when not involved, 86 per cent.

The author believes these figures are a great improvement over other published figures and it is believed that they are well within the reach of any center which decides to pool its cases in the hands of a special team which will carry out a radical approach to the disease. —*Ely Elliott Lazarus, M.D.*

MISCELLANEOUS

Rhythmic Fluctuations in the Vegetative System During the Course of the Menstrual Cycle (Die rhythmischen Schwankungen im vegetativen System im Verlaufe des Zyklus). J. ARTNER. *Geburtsh. & Frauenh.*, 1954, 14: 677.

THE AUTHOR REVIEWS the mechanism of the workings of the vegetative nervous system during the course of the menstrual cycle and explains it as follows:

During the follicular phase the parasympathetic system and those endocrine glands which produce parasympathomimetic hormones are predominant. The hypophysis, however, under the influence of parasympathetic impulses from the midbrain, produces a gonadotropic hormone which stimulates the glands making sympathomimetic biocatalysts; then a vegetative turnover occurs at mid-cycle and opposite effects occur. In the luteal phase the sympathetic system predominates, together with those endocrine glands producing sympathomimetic hormones. The hypophysis, meanwhile, by means of its trophic hormones, prepares the parasympathetic glands for their functioning during the next follicle phase.

—*Warren R. Lang, M.D.*

Disruption of Abdominal Wounds (Sulla deiscenza delle ferite laparatomiche). ENNIO BORTINI. *Ann. ostet. gin.*, 1954, 76: 99.

THE CASE HISTORIES of 15 instances of disruption of the laparotomy wound, together with a study of the literature, form the material for this report. These 15 dehiscences represent the material observed at the University of Milano, from the end of 1927 to the end of 1948, among a total number of 17,842 gynecological laparotomies (0.084 per cent). It is a notable fact that there were no instances of disruption in the 9,877 laparotomies with transverse incision; this result reveals why the author prefers to employ the Pfannenstiel incision in all instances in which it is practicable.

Of these 15 patients, 7 were operated upon for fibroma, 3 for ovarian cyst, 3 for endometrial carcinoma (operation of Freund), and 1 for carcinoma of the portio (operation of Wertheim).

In 7 instances the dehiscence occurred on the eighth postoperative day, in 4 instances on the ninth, and in 1 instance each on the tenth, eleventh, twelfth, and thirteenth days. The resuturing of the wound—it was always carried out as soon as possible after the catastrophe—was always, when practicable, done in the original three-layer manner; otherwise interrupted nonabsorbable through-and-through sutures were used.

The general mortality was 33.33 per cent. The mortality was heaviest in the fibroma group (4 of the 7 cases); 2 of these deaths occurred in patients affected with submucous fibroma, 1 patient had a degenerated fibroma and the other had necrosis. The other 2 deaths were instances of giant fibroma with difficult removal. The fifth death was that of a patient with diabetes and death was attributed to the diabetes itself and not to the dehiscence, because after resuture healing had taken place without trouble (per primam).

Of great importance, of course, is the cause of the disruption. The author thinks that doubt is cast upon the significance of the constitutional factors (general asthenia, hypoproteinemia, avitaminosis) by the fact that the patients heal, with resuture following the disruption, in an astonishingly rapid and thorough manner. Such healing suggests the intervention of a purely temporary cause of disruption. These temporarily effective factors he envisions as mechanical, such as intrusion of the intraperitoneal contents (intestine, greater omentum) through the peritoneal barrier and between the flaps of the abdominal wound. This intrusion does not, of course, postulate careless suturing; the original suturing of the abdominal wall in the author's material was all done by experienced surgeons (Alfieri *et al.*). He believes that coughing and other forms of strain on the suture line (abdominal distention) may be principally at fault, and he points out that most of these factors can be ameliorated or prophylactic treatment could be given. However, he does not entirely negate the influence of constitutional factors, and he mentions the fact that in all the patients in whom ascorbic acid was administered following resuture, the resutured wound healed without incident.

—*John W. Brennan, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

The Hypophysial Alterations in the Syndrome of Toxic Pregnancy (Le alterazioni ipofisarie nelle sindromi tossiche gravidiche). G. ANZISI. *Arch. ostet. gin.*, 1954, 59: 1.

TWO HYPOPHYSIAL GLANDS were subjected to histologic study. The specimens were procured from two women who died in the clinic, under eclamptic manifestations, following cervical suprapubic cesarean section.

These two patients presented practically identical clinical pictures (edema of the ankles, hypertension, albuminuria, cyanosis, rapid pulse, visual disturbances, and tachypnea); the cause of death was the same—acute pulmonary edema, and, finally, the histologic findings in the posterior portion of the anterior lobe of the hypophysis were practically the same.

Not only were the histologic findings in the two cases here reported much alike, but they also resembled the findings reported by other authors for other conditions (premature detachment of the normally situated placenta, nephropathy of pregnancy) which might conceivably be classed together as all caused by some identical toxic process related to pregnancy itself. It is certain that there was nothing in the histologic picture suggesting bacterial infection, such as capillary diapedesis or abscess formation, and the presence of bacteria could not be demonstrated.

The infiltrative process consisted almost exclusively of large and small lymphocytes, and these lymphocytic collections were largely concentrated along the blood vessels. The author believes that the process was essentially a reaction to a toxin in the reticuloepithelial system and between the cords of gland cells (these gland cells were largely of the gravid type), not infiltrating the cords themselves; in fact, the anterior hypophysial gland cells did not show any degenerative or other changes suggesting involvement in the process.

The odd aspect of these two specimens was the fact that the infiltrative process was limited in both instances to the posterior and lateral regions of the anterior lobe of the hypophysis. Starting from the posterior surface of the anterior lobe, the first 50 or 60 sections of the microtome evidenced heavy infiltration, then the sections began to clear, until eventually they appeared to be entirely normal. In both of these patients the posterior lobe was not involved and the middle lobe exhibited at most some areas of vascular hyaline degeneration. —*John W. Brennan, M.D.*

Premature Separation of the Placenta (Die vorzeitige Loesung der Plazenta; Beitrag zur Frage der Spaettoxikosen). KONRAD HEIM. *Muench. med. Wschr.*, 1954, 96: 1151.

CONTRARY TO OLDER BELIEFS, we think nowadays that external force or even the excessive use of oxytocics is responsible only for a few cases of premature separation of the placenta. In the majority of cases the causative mechanism seems to be associated with events like rupture or increased permeability of the blood vessels, abnormal local hyperemia or hypertension (Frankl) at the placental site, or toxic and infectious insults. Three types of abruptio placentae (De Lee), or uteroplacentar apoplexia (Couvelaire) can be differentiated: (1) a limited local apoplexia which is usually not discovered until the afterbirth is inspected, (2) retroplacental apoplexia without serious complications (at least in the mother), and (3) severe apoplexia involving the whole uterine wall and sometimes also other organs like the liver, kidneys, and stomach. Premature separation of the placenta is not as frequent as placenta previa. It occurs in an estimated 0.3 to 0.4 per cent of deliveries and does not seem to depend on the parity.

The syndrome of hemorrhage, shock, and toxicosis is more or less developed according to the localization and extent of the hemorrhage. In a third of the cases the hemorrhage is internal only (Irving), and is then particularly dangerous because of the excessive dilatation of the uterus and the delay in diagnosis. The amount of visible blood is, consequently, no indication of the severity of the situation. In cases of intramuscular hemorrhage (Couvelaire) the uterus may show tetanic contractions and become boardlike with a rigid internal os, and the contractions and dilatation may be arrested. In some instances the blood may penetrate further into the loose parametrian tissue up to the kidney area (apoplexia uteroparametrica, uteropelvica), when typical flank pains and peritoneal symptoms with vomiting may lead to the diagnosis. It is usually impossible to make out fetal parts or heart tones. Hemoglobin values are often so surprisingly low that a toxic blood destruction prior to the actual hemorrhage must be assumed.

Aside from the signs of anemia, uterine dysfunction, and abdominal shock, the picture of toxemia with hypertension, albuminuria, and/or edema appears in approximately two-thirds of the cases, occasionally with the grave complication of oliguria or anuria. The changes in the kidneys with cortical necrosis correspond to eclamptic glomerulonephroses. The extremely high incidence of postpartem atony due to excessive dilatation, destructive changes of the uterine wall and the syndrome of afibrinogenemia with its high mortality are further grave complications. Further studies of the problem should comprise the question of infarction of the placenta, hematoma of the theca, the rôle of a frequently encountered interstitial adenohypophysitis, and immune biologic relations between mother and fetus.

The author believes that the severity of hemorrhage into the placental site must be related to the increased gonadotropin activity of the placenta in all toxemias. An allergic basis for these events or a systemic incompatibility between mother and fetus with severe systemic damage to the maternal organism appears to be the cardinal problem.

The treatment of the condition must begin with the prevention of toxemia in the prenatal period. Mild

cases of premature separation of the placenta can be treated conservatively, in many cases with additional artificial rupture of the membranes and the careful use of oxytocics. In the intermediate and severe cases all methods have been tried. Statistics seemed to prove at first that abdominal section was superior to all methods of vaginal delivery, especially in the light of the poor results with Dührssen's incision, version, extraction, and vaginal section, which all had a very high mortality. Today, however, rigid conservative management is preferred by a great number of obstetricians since artificial rupture of the membranes, oxytocics, the treatment of toxemia, and the management of shock can be employed so much more intelligently and safely. —*W. D. Bergman, M.D.*

LABOR AND ITS COMPLICATIONS

The Importance of Strictly Conservative Obstetrics in the Management of the Third Stage of Labor (Die Bedeutung der streng konservativen Geburtshilfe fuer die Leitung der Nachgeburtsperiode). S. KOLONJA. *Wien. med. Wschr.*, 1954, 104: 839.

DURING the last century the third stage of labor was managed according to two opposite opinions. One school of thought (Credé) advised that the placenta be expressed immediately after delivery of the infant. The other (Ahlfeld) school of thought stated that untimely manipulations of the uterus are the most frequent causes of atonic hemorrhage.

In modern obstetrics it is widely believed that with oxytocic drugs during or after delivery of the infant the third stage of labor can be shortened by an increase in uterine tonus, blood loss can be decreased and the number of operative procedures can be reduced. These drugs may, on the other hand, interfere with a physiologic rest period of the uterus, with the automatic adjustment of the genital organ to a much smaller volume, and may lead to its premature exhaustion. It is, further, doubtful whether it is necessary at all to reduce the average amount of bleeding which might only serve to return the physiologically increased blood volume of pregnancy to normal levels. Ergotrate may also produce a paradoxical effect by vasoconstriction of the nutrient vessels of the uterus. Vasodilators (nicotinamid, priscoline) may then be required to get the oxytocics to their site of action. Routine manual removal of the placenta immediately after delivery of the infant, as advocated by some American authors (Cacciarelli *et al.*), should certainly be condemned.

From the files of the Women's University Clinic, Vienna, the author has collected 630 cases of third stage disturbances among nearly 20,000 deliveries in the 12 years ending 1951. This is an incidence of 3.23 per cent. Hemorrhage was present in 68.2 per cent, delayed separation of the placenta (more than 1 hour) in 40.5 per cent, adherent placenta in 23.6 per cent, incomplete placenta in 9.4 per cent, and placenta accreta in 5.4 per cent of these 630 cases. Hysterectomy was necessary in 3 instances only. It appears significant that in one-third of the cases oxytocics could be blamed for the disturbance. In 27.7 per cent previous operative procedures, and in 24.4 per cent general anesthesia may have been responsible. Of the total deliveries two comparable groups of 2,900 cases each were selected, and the results of extreme conservatism were compared with those of more active management in the other group. The figures given indicate that hemorrhage was four times as frequent, and incomplete placenta nearly twice as frequent in the actively treated group. The necessity of operative intervention is consequently significantly decreased by the conservative management.

The author arrives at the conclusion that the rare use of oxytocics combined with the careful observation of labor is the best prophylaxis against third stage complications. Drugs containing ergot and pituitary hormones should be given in cases in which disturbances can be anticipated from the history and course of the condition. Their routine use is not advisable. —*W. D. Bergman, M.D.*

Abuse of the Cesarean Operation (Abuso delle operazioni cesaree). LUIGI PASCARELLA. *Clin. ostet. gin.*, 1954, 56: 65.

FORTY-EIGHT WOMEN who had undergone cesarean section for previous pregnancies and who then became pregnant again and were delivered spontaneously by forceps, podalic extraction, or version and podalic extraction at the Obstetric and Gynecologic Clinic of the University of Rome, Italy, in the period from April 1, 1946 to March 31, 1950, serve as a basis for a reappraisal of indications for the conditions represented. There were 32 instances of pelvic deformity, 12 of total placenta previa, 2 of eclampsia, 1 of shoulder presentation, and 1 of face presentation.

The 12 cases of total placenta previa are not discussed, since this condition constitutes the classic field of application of cesarean section, and it is generally agreed that cesarean section in this anomaly of pregnancy is fully justified.

In the group of 32 patients with pelvic deformities, who had previously undergone cesarean section, 19 subsequently had spontaneous deliveries; 10 were delivered with forceps, and 3 by means of version and podalic extraction. The author believes that there is always present the possibility of delivery through the natural passages, even of the full-term child, if the conjugata vera in the simple flat pelvis is not less than 8 cm. and if in the generally contracted pelvis it is not less than 8.5 cm. In general, however, unless there is a secondary indication for cesarean section (old primipara, placenta previa, and fetal distress with uterine inertia) the patient is allowed to go to term and the trial of labor is permitted. The maneuver of Hillis is harmless and does not increase the danger of contamination of the genital passages; if by suprapubic pressure the head can be depressed and impacted at the level of the interspinous line there is always the chance that labor will proceed spontaneously. The Walcher position may be used in contraction of the upper strait, or the opposite position, with the thighs flexed on the abdomen and the legs on the thighs, for contraction of the outlet. In the contraction of the entire pelvic canal some advantage may result from assuming the Walcher position in order to assist in the engagement of the presenting part, and then the opposite position (described above) for its disengagement. In some instances the subcutaneous symphysiotomy of Sarate, or the high symphysiotomy of Costa

may be resorted to. Following symphysiotomy extreme care should be exercised in the application of rotatory movements, especially when using the forceps of Naegele, or others with accentuated pelvic curve; the forceps of Kjelland is much safer where some rotation of the head must be attained. These considerations, of course, also apply to instances of malposition of the fetus.

In the treatment of eclampsia, cesarean section is undesirable and every effort is made to avoid such a contingency. On the author's service medical methods are tried faithfully. These consist of such old and tried remedies as the German aquavita (scammony, 20 parts, jalap root, 20 parts, ipomaea radix, 10 parts, and alcohol, 960 parts), or the elixir of Le Roy (scammony, jalap, ipomaea and senna), and the various forms of sulphate of magnesium. Stroganoff's method with morphine has been of help. Blood-letting may be employed in hypertensive cases. Piero Marziale has already reported brilliant results in eclampsia at this clinic by means of the administration of co-carboxylase (pyrophosphoric ester of vitamine B_1). If manual delivery is necessitated the forceps or version, properly applied, is much less traumatizing than cesarean section.

All in all, the obstetrician must not forget that cesarean section, although greatly improved in its results of late years, is still not devoid of unpleasantness and even danger, particularly for the mother.

—*John W. Brennan, M.D.*

Obstetric Shock; Some Interdependent Problems of Coagulation. CHARLES L. SCHNEIDER. *Obst. Gyn.*, 1954, 4: 273.

THE DISTINCTION of obstetric shock as a characteristic syndrome separate from the shock of obstetric hemorrhage came with the discovery of amniotic embolism. Well defined obstetric shock may also develop during abruptio placentae. In both conditions there is disseminated obstruction of the pulmonary arterial circulation. In each, circulatory failure may lead to acute cor pulmonale; that is, to acute dilatation of the right heart. Two different pathogenetic processes are concerned in the two clinical conditions.

In amniotic embolism the obstruction of the pulmonary vascular bed is the result of disseminated embolization of debris from anniotic fluid which fortuitously gains entrance from outside the circulation—from debris disseminated into the pulmonary vascular bed as a result of amniotic-fluid embolism.

In abruptio placentae, the obstruction of the pulmonary vascular bed is the result of disseminated deposition of fibrin formed by coagulation from fibrinogen within the circulation—fibrin deposited by a peculiar process of fibrin embolism.

Each condition has been, at times, observed to be associated with convulsions. It is to be suggested that the circulatory failure and anoxia engendered by the circulatory obstruction and failure (perhaps in combination with, and in part due to, or counteracted by release of a platelet vasoconstrictor, serotonin) may be one precipitating cause of eclampsia—particularly eclampsia as a complicating disorder in patients in whom an underlying toxemia of pregnancy is already present.

Both in abruptio placentae and in amniotic embolism, hemostasis may become defective largely, or at least in part, as the result of disorders of the plasma components of coagulation. The disorders are probably of different kinds and origins. In abruptio placentae the defect is essentially the result of defibrination of the circulating blood. In amniotic embolism, currently available evidence leads to the question of a possible inhibition of coagulation by release of an anticoagulant into the circulating blood. Fibrinolysis may play a variable role in one or both syndromes.

Supportive treatment is indicated in both syndromes.

The diagnosis of abruptio placentae is usually made early enough to institute therapy to prevent recurrent extensions and autoextraction of the abruptio placentae. Definitive treatment may be directed toward prevention of extension of the premature separation of the placenta. Unless rupture of the membranes can promote delivery while preparations are being made, immediate cesarean section is indicated, and this not merely for fetal salvage, but in the best interests of reducing the risk of complications to the mother. Hysterectomy at the time of cesarean section is not a satisfactory procedure for the control of hemorrhagic diathesis; this merely transfers the site of hemorrhage and compounds the hazards of surgery under already adverse conditions. Instead, the coagulation defect of the blood itself should be corrected. Blood transfusion for this purpose, and ample to replace blood loss coincidental with surgery, is imperative.

It is hazardous to transfuse excessive amounts of blood, or to increase the circulatory volume by excessive infusion of other fluids because this may tend to further overload the already once embarrassed right heart. This hazard is probably greatest in amniotic embolism because the acute cor pulmonale is more persistent. By contrast, possibly because the intravascular occlusions are susceptible to fibrinolysis, the obstruction, or the acute circulatory failure, of abruptio placentae appears to be a self-limiting process, and therefore relatively amenable to successful supportive and obstetric management. —*Charles Baron, M.D.*

NEWBORN

A Contribution to the Study of the Problem of Acardia; Personal Case of "Acardiacus Amorphus Globosus" with Absence of Tissues of Endodermal Derivation and with Palpebral Malformation in the Twin (Contributo allo studio del problema dell' acardia; caso personale di "acardiacus amorphus globosus" mancante dei tessuti de derivazione entodermale e con malformazione palpebrale del gemello). CANDIDO MORLUNGHI. *Riv. ital. gin.*, 1954, 37: 18.

THIS MONSTER was born shortly before its uniovular twin in the course of a somewhat delayed but otherwise normal spontaneous delivery. The mass was attached to the same placenta as its twin by a slender and short cordlike structure containing some mucoid tissues and two blood vessels with delicate walls and ample lumina. The mass was ovoid and somewhat reniform in shape with a major diameter of 8.2 cm. and a variable thickness of 2.5 to 3.5 cm., i.e., it was somewhat flattened or pancake-like. It was complete-

ly covered by cuticle which, although without the ridges corresponding to the dermal papillae, was evidently analogous to a skin, and even presented the histologic picture of the typical sweat and sebaceous glands and normal looking hairs, some of them microscopic in size. Internally there were present centers of ossification, developing in fairly normal looking cartilaginous tissue and large tracts of connective tissue, in places very dense and with parallel coursing of the fibers. The microscopic and macroscopic appearances of the growth are presented in excellent photographs and photomicrographs in the original text.

Finally, and this is the crucial finding, there was no trace anywhere in this monster of any structures which derive from the embryonic endoderm. Another remarkable finding in this instance was an odd apparently congenital fissure (coloboma) of the upper lid of the right eye of the twin. This child, weighing at birth 3,400 gm., was otherwise apparently normal. It is on these two findings, viz., the coloboma in the eye of the twin and the lack of endodermal derivatives in the monster that the author bases his theory as to the pathogenesis or teratogenesis. The unusual amorphous picture presented by the tissues of this monster would seem to postulate the time of teratogenic formation, or deviation, at an extremely early period of embryonic development. The noxa which caused the deviation must however have acted upon the product of pregnancy at some period ulterior to that when the primitive embryonic material divided, since the twin continued to develop normally, to all appearances, long after this period.

With reference to the possible teratogenic relationships between the coloboma in the twin and the development of the monster itself, it is admitted that the two malformations could be causally entirely independent; however the author prefers to consider the cause of both malformations as residing in a noxious agent or influence acting on the two malformations during different epochs of their development. With reference to the objection that two such diverse types of malformation could result from a common noxious agent, the matter is dismissed by the author with the statement that such objection is only apparently valid when one considers the different epochs in the development of the pregnancy when these two injuries occurred. —*John W. Brennan, M.D.*

MISCELLANEOUS

Grand Multiparas; a 10 Year Study. ELINOR MILLER. *Obst. Gyn.*, 1954, 4: 418.

THE AUTHOR ANALYZES 563 deliveries of grand multiparas (Para VI and over) during a 10-year period at the Catholic Maternity Institute, Santa Fe, New Mexico, for incidence of complications, duration of labor, age of patients, prematurity, hypertension, and renal disease. Of 2,303 patients delivered within the 10 year period, 24.3 per cent were grand multiparas, a much higher percentage than that reported by other investigators.

Malpresentations (especially transverse, brow, and face) were encountered more frequently than the general average. Abruptio placentae and placenta previa showed a slight increase in incidence; postpartum hemorrhage occurred more frequently (8.3 per cent). The incidence of retained or adherent placentae was not increased. The maternal mortality was low (0.17 per cent). There was no instance of rupture of the uterus.

The stillbirth rate showed a tendency to increase in the higher parity brackets. Increased age and parity was found to increase the incidence of prematurity.

Chronic hypertensive vascular disease (or chronic nephritis) was found in 20 per cent of women who had borne 8 to 9 infants, while with a parity of 10 or over, it occurred in 30 per cent. The incidence of hypertension, renal disease, and associated conditions was far lower than the figures given by other investigators. —*Alan Rubin, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Pheochromocytoma; a Study of 15 Cases Diagnosed at Autopsy. ALEXANDER M. MINNO, WARREN A. BENNETT, and WALTER F. KVALE. *N. England J. M.*, 1954, 251: 959.

A STUDY was made of the records of 15 cases of pheochromocytoma found in a series of 15,984 consecutive autopsies performed at the Mayo Clinic from 1928 to 1951, inclusive. Pheochromocytoma was listed among the possible diagnoses in 3 of these cases, whereas the tumor was unsuspected in the remaining 12.

In 3 cases, the pheochromocytoma was an incidental finding and was apparently symptomless. The lesions in 11 cases fell into the group of benign pheochromocytomas with hypertension, either paroxysmal or sustained, and the tumor in 1 case was considered a malignant pheochromocytoma with metastasis. The hypertension was persistent in 10 cases and paroxysmal in 2.

Pheochromocytoma was associated with neurofibromatosis in 1 case. This is the eleventh instance of association of these two disorders recorded in the available literature.

Evidence of benign nephrosclerosis was present in 5 cases; malignant nephrosclerosis was present in 1 case and no demonstrable nephrosclerosis was evident in the remaining 9 cases.

Death in 5 of these cases resulted from shock after incidental operations, which suggested the extreme danger of operative procedures in the presence of a pheochromocytoma. Autopsy revealed cardiac hypertrophy in 10 cases and pulmonary edema in 5.

Plastic Operation on a Huge Hydronephrotic Kidney in a Boy Child with Only One Kidney (Grosse Hydronephrosenplastik an einem einnierigen kleinkind). PETER BISCHOFF. *Urologia*, Treviso, 1954, 21: 256.

During the past few years the author has performed a number of plastic operations on the renal pelvis in children with very good results. This is in marked contrast with the experience of Kretschmer (*Surg. Gyn. Obst.*, 1937, 64: 634) who reported the use of plastic procedures in 101 cases of bilateral hydronephrosis in children without a single major success. The author feels justified in proposing for discussion a particularly impressive experience in his own practice.

At birth this child had an enlarged abdomen and at 18 months of age the swelling had become quite marked. The gastrointestinal roentgen examination disclosed displacement of the intestines suggestive of a large retroperitoneal tumor in the right kidney region. Pyonephrosis of the left kidney supervened and the organ had to be removed.

Eleven days after nephrectomy, anuria developed and the intravenous pyelogram disclosed a huge hydronephrotic kidney on the right side.

The details of the operative procedure can best be understood from the appended sketches (Fig. 1.). The

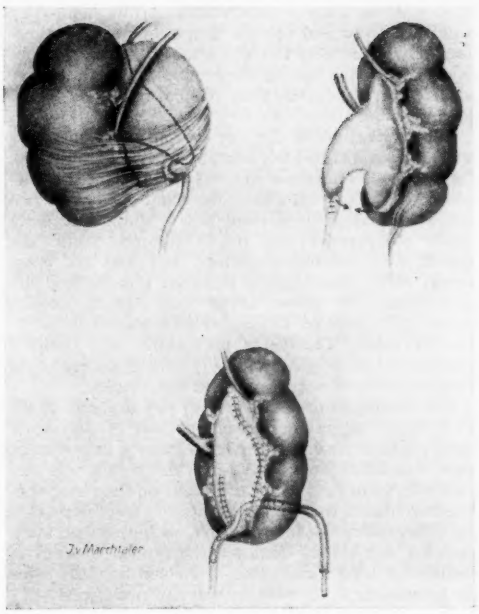

FIG. 1 (Bischoff)

smaller tube shown passing through the transrenal drain is a so-called ureteral splinting tube. This was left in place for 24 hours and then withdrawn; the fistula from the transrenal drain closed on the eleventh day.

A recent pyelogram in this patient disclosed a normally shaped renal pelvis with perceptible protrusion of the previously flattened papillae. The excretion of dye was intense and other tests of renal function indicated a normally secreting organ. The author believes that in 1 or 2 years more the single kidney will show practically normal roentgenologic findings.

The author believes that plastic operation on the kidney and renal pelvis of children is not only successful in most instances, but is actually easier to perform than the same procedures in the adult. In the instance here described the operation saved the life of a child who otherwise would have been condemned to death, and the results obtained promise a permanent cure. Final evaluation in this instance will have to wait a few years. —*John W. Brennan, M.D.*

Bilateral Renal Carcinoma (Carcinoma renale bilaterale). FRANCO DE GIRONCOLI. *Urologia*, Treviso, 1954, 21: 169.

THE PATIENT was a 57 year old army officer who, in 1927, had suffered an attack of renal colic. In 1952, while stooping in the garden, planting flowers, he suf-

fered sudden pain in the inguinal region, which increased when he stood up. He also noted an odd fullness in the painful region.

Physical examination disclosed huge bilateral masses which evidently represented the kidneys. The consistency of these masses was uniformly firm; they could not be moved nor did they move with respiration. The concentration test was surprisingly good. In the urographic examination, elimination of the dye occurred on both sides in the normal time, and was of good concentration.

Catheterization of the ureters on both sides was easily accomplished and, like the urographic findings, disclosed two enormous kidneys with atypical deformation of the calyces and of the renal pelvis; the two pelves seemed to be pressed out of shape and were partly compressed and partly dilated, while the calyces were dilated, roundish, and had lost completely their characteristic contour. On the left side particularly the pelvic cavity appeared to be expanded in a manner to suggest an obstruction to the flow of urine. Ten years previously, after painful attacks and subsequent pyelographic examination, a diagnosis of hydronephrosis had been made.

With retropneumoperitoneum, the findings again were more suggestive of tumor than of polycystic kidney. On exposure of the left kidney a huge tumor mass, extending downwards into the pelvis, was discovered. A similar mass was present on the right side. The two masses were in contiguity but were nevertheless independent of one another. A biopsy specimen from the left kidney disclosed the typical findings of undifferentiated carcinoma. Fourteen months later the patient died; an autopsy was not performed.

Although there was no proof of the nature of the tumor on the right side, it was surmised, from the palpatory and pyelographic findings that it was of the same nature as the one on the left side.

From the general similarity in development and in appearance of the two tumors, the author feels justified in assuming that the case represented an instance of multiple renal carcinoma of the kidneys; that is, the one tumor was not simply a metastatic diffusion from the other. The absence of evidence of metastasis in other portions of the body confirms his assumption that the tumors developed more or less simultaneously and independently of one another.

In this particular instance the differentiation between tumor and polycystic kidney could be satisfactorily resolved only by exposure of the kidney and biopsy. —*John W. Brennan, M.D.*

BLADDER, URETHRA, AND PENIS

Recent Anatomic and Physiologic Facts Regarding the Prostate and the Vesical Outlet and Their Significance for Operative Interventions (Neuere anatomische und physiologische Erkenntnisse ueber Prostata und Blasenauslass in ihrer Bedeutung fuer operative Eingriffe). Otto Hennig. *Zschr. Urol.*, 1954, 47: 457.

The pelvic diaphragm is formed chiefly by the levator ani muscle, reinforced by the loosely attached visceral pelvic fascia, thus forming a hermetic wall between the interior of the pelvis and the ischiorectal fossa. As the prostate lies above the pelvic diaphragm, the retropubic or suprapubic approach to it may precipitate a dangerous pelvic phlegmon. For that reason retropubic prostatectomy, as originally proposed by Van Stokum, could be popularized by Millin only when the aid of antibiotics became available. The author doubts that antibiotics and sulfonamide therapy is biologic, since its prophylactic application prevents the much superior formation of specific antibodies, the absence of which renders the surgeon helpless when microorganisms are resistant to antibiotics.

In view of these facts the perineal or the ischiorectal approach to the prostate is preferable because favorable drainage conditions prevent spreading infection with resulting pelvic cellulitis. The loose attachment of the visceral pelvic fascia permits a blunt approach to the prostate from the ischiorectal fossa, and the fascial reduplication (Denonvillier's fascia between rectum and prostate) is so loose as to form almost a cleavage. This anatomic condition permits easy access with temporary displacement of the rectum.

The anterior surface of the prostate is fixed to the pubic bone by three extensions of the pelvic visceral fascia, forming the lateral and medial puboprostatic ligaments, above which the pubovesical muscle and ligaments are located. Of equal importance are other structures at the anterior prostatic surface, namely, the vesicoprostatic and pudendal plexuses and occasional arterial anomalies, all of which may be a source of technical difficulty. Neuralgias (obturator nerve) and osteitis pubis form postoperative complications in the wake of the anterior approach.

All these are avoided by exposing the posterior surface of the prostate. This organ is poorly described in text books and the accurate study of Heiss is recommended. Originally (in the newborn) the prostate forms a shieldlike attachment to the posterior urethra and gradually pushes around the urethra by growth of the lateral lobes. The adenoma follows these paths of development, originating in the posterior lobe, and even when the lateral lobes have been involved they remain separated by a septum of connective tissue. This makes the posterior approach more logical than the anterior. Moreover, the anterior surface of the prostate is covered by a triangular muscular plate which is intimately connected with the bladder wall, urethra, the lateral lobes and the pubic attachments.

Lowsley distinguishes between the rudimentary urethral glands, confined within the borders of the urethral musculature, and the true prostatic glands which originate and grow beyond the musculature exclusively posteriorly. Embryologically the prostate consists of several parts, separated by the ejaculatory ducts, a cranial or bisexual and a caudal or male part. The bisexual part provides Skene's glands, which in the aging female may form an adenoma, the "female prostate". A third "female" part, originating from the müllerian ducts, the vagina masculina (i.e. prostatic utricle) may develop hypertrophic nodules, when, after the age of 40, the predominance of male hormones ceases to exist.

Three stages can be recognized in the development of prostatic hypertrophy: (1) due to hormonal imbal-

ance, nodes of undifferentiated spindle cells form from the female mesenchymatic rest; (2) they mature into fibromyomas. In about 3 per cent of the cases the process is arrested at this stage. However, in 97 per cent a third stage develops when the solitary nodes (of stage 2) displace the epithelium of the periurethral glands; these proliferate and partake in the formation of the fibroadenomas; thus the prostatic adenoma truly originates from embryonal remnants of the müllerian ducts. These considerations are important for the surgical approach, because no matter in what form the prostatic hypertrophy will eventually present itself, its origin is always at the posterior surface.

Rarely is the muscular apparatus of the vesical outlet explicitly mentioned in descriptions of the various methods of prostatectomy. The author credits Heiss with recognizing that the lissosphincter of the vesical neck is not ring-shaped but consists of two loops. Prostate and vesical floor remain separated by the muscles of the vesical outlet, whereby fibers of the latter intertwine with the prostate.

The lissosphincter consists of two loops; the anterior (stronger) connects with the longitudinal muscular layer of the posterior bladder aspect, while the posterior (weaker) continues into the anterior longitudinal layer. Thus the lissosphincter is a continuation of the detrusor muscle; its fibers are finer, coarse connective tissue septa are absent, its height is up to 1 cm., and its thickness up to 0.5 cm.

Bladder function consists of storage and expulsion of urine. The laws of tonus of smooth muscles apply to the detrusor. Tonus, as defined by Uexküll, is the property of smooth muscle to oppose increasing stretch by constant resistance (as contrasted with the increasing resistance of a rubber-band to increasing stretch). The consistency of the muscle is a measure of its tone. Applied to the phase of storage, this means that the intravesical pressure remains constant, so that no desire of micturition occurs; Schwarz demonstrated this by cystometry of the bladder filled intrinsically through increased diuresis. The intravesical pressure remained constant, independent of the volume, until the threshold of stretch was reached. The lissosphincter causes a tonic occlusion of the vesical outlet which is passively reinforced by a well developed submucous venous plexus. Additional support is furnished by the rhabdosphincter which surrounds the urethra in both sexes. The function of storage ends and that of expulsion starts when the threshold of the muscle to stretch has been reached. Increase of tone with following muscular contraction converts the tonic stage into the kinetic stage. Owing to the change of shape of the bladder during expulsion, from transverse oval to spheric, and eventually into vertical oval, and owing to the contraction of the longitudinal detrusor fibers, their continuation in the loops of the lissosphincter is relaxed and the vesical outlet is transformed into an open tube. (Author explains this action by comparing it with the engagement of a cork in a rubber tube; only longitudinal compression of the rubber permits disengaging the stopper from the grip of the circular forces. (The descent of the pelvic floor, as observed fluoroscopically by Muellner and cinematographically by Hinman, Jr. are not mentioned. E.B.). The uvula of the bladder outlet is characteristic for the male and plays a protective role during ejaculation. The occlusive function of the uvula is reinforced by a venous, cavernous plexus and also by the striated urethral sphincter fibers which extend over the entire anterior part of the prostatic urethra, but are confined to a small distal area of the posterior prostatic surface. The expulsive stage in the female and male differs in that the uvula is retracted once the vesical outlet is relaxed. The retractor muscle of the uvula extends dorsally into the longitudinal layer of the detrusor while ventrally its fibers fan, brush-like, close to the uvular mucosa. The retractor uvulae acts also on the posterior loop of the lissosphincter which it pierces. Anterior countertraction is exerted by the pubovesical ligaments and muscles, which traverse the fibers of the anterior loop of the lissosphincter. Stretch on all these attachments has a dilator effect on the vesical outlet. The cavernous plexus collapses during micturition, thus enlarging the vesical outlet. The author states that the last drop of urine is eventually expelled by a sort of invagination of the dome owing to abdominal pressure. The rhabdosphincter relaxes during micturition. Volitional micturition without desire is said to occur by cortical parasympathetic impulses, facilitated by the abdominal pressure; the old theory of detrusor-sphincter antagonism must be relinquished, and one must rather assume that the parasympathetic contraction of the detrusor causes synchronous relaxation of the lissosphincter. Any obstructive uropathy at the vesical outlet interferes with this mechanism and leads to detrusor-hypertrophy (trabeculation). In removing the adenoma the vesical outlet and its structures must be preserved and the enucleation performed without trauma, lest incontinence result. Voelcker's ischial prostatectomy fulfills these postulates and results in good drainage conditions and the avoidance of nerve and vascular damage.

—*Ernest Bors, M.D.*

Leiomyoma of the Bladder (Il leiomioma della vescica). VINCENZO ZAFFAGNINI. *Arch. ital. urol.*, 1954, 27: 184.

A CASE of leiomyoma of the female urinary bladder and a discussion of 96 cases appearing in the literature form the basis for this report. The author's patient was operated upon at the Surgical Clinic of the University of Bologna.

The patient was a 33-year-old unmarried seamstress who, for 2 months, had suffered lancinating pains at the end of micturition. During the second attack the urine was found to be turbid, and later the last drops of urine were observed to be markedly sanguineous.

The cystoscope revealed in the region of the cupula of the bladder, a little to the left of the mid-line, a rounded tumefaction the size of a walnut. The mass was sessile and covered with mucosa of normal appearance, except at its very summit where ulceration was observed. Manipulation with the ureteral catheter disclosed that the mass was soft and easily compressible, and that it bled easily.

At operation the tumor, together with a surrounding area of healthy mucosa, was removed through a suprapubic cystotomy opening leaving the bladder wall, i.e., the bed of the tumor, intact. The edges of

the wound were drawn together, the cystotomy wound closed, and an indwelling catheter left in place. The wound healed per primam and ten years later the patient was without symptoms and showed no evidence of recurrence or of functional disturbance.

Histologic examination showed the tumor to be made up of more or less dense fasciculi of greatly elongated cells with elongated rodlike or fusiform densely staining nuclei. The fibrillovascular stroma was scanty. The diagnosis was leiomyoma of the urinary bladder.

The author seems to favor the estrogenic theory of origin of these tumors; this belief is based partly on the fact that women are predominantly involved (55 women to 34 men in the material in which the sex was recorded), and during the period of life when estrogenic function would be expected to be at its peak (49.9 per cent from 30 to 49 years of age), or when women might be especially liable to functional disturbances. The occurrence of these tumors in the male in so many instances does not invalidate the theory, since the usual androgenic neutralization of the male estrogenic function (e.g., the estrogenic production of the suprarenal glands) might fail, leaving also the male the prey to estrogenic production in excess.

With reference to diagnosis, the intravesical type of this tumor can frequently be diagnosed by means of its direct symptoms (hematuria, pains, cystoscopic, and chromocystic findings); however, the extravesical type can only be suspected from its action (pressure effects) on neighboring structures. The intramural, infiltrative type has never been diagnosed clinically, only at autopsy.

The treatment seems to be exclusively surgical, the results of such treatment are considered to be good.

—*John W. Brennan, M.D.*

Diverticula of the Female Urethra (I diverticoli dell uretra muliebre). FRANCESCO GAROFALO. *Arch. ital. urol.*, 1954, 27: 255.

SEVEN INSTANCES of diverticulum of the female urethra have been observed at the Hospital M. Malpighi of Bologna, Bologna, Italy. Four of these 7 patients preferred simple evacuation of the cavity of the diverticulum to surgical removal of the sac. Three chose to be operated upon and it is this group which especially interests the author.

The first patient was a 35 year old housewife who, some months previously, had suffered an attack of dysuria with evident pyuria. Genital examination disclosed a lump protruding from the anterior wall of the vagina. By pressure upon this lump it became flattened and with simultaneous discharge from the urethral meatus of a purulent liquid mixed with traces of blood. With the MacCarthy urethrocystoscope there was visible a hyperemic area, and protruding from its center a mass of granulations surrounding a sinus through which a ureteral catheter could be passed for about 3 cm. into a diverticular cavity. An attempt was made to demonstrate the diverticulum with a dye by causing the patient to expel the opaque liquid from the bladder while occluding the external urethral meatus with the finger; this attempt was unsuccessful.

The diverticulum was excised through a lozenge-shaped incision in the anterior wall of the vagina; the opening into the urethra was closed by a double row of everting sutures and the anterior wall of the vagina was repaired in the usual manner. A permanent catheter was inserted and left in place for 3 days. Under protection of the sulfonamides (vaginal applications) healing was uneventful, urination remained unobstructed, and the patient was discharged as cured.

Histologic examination of the removed specimen disclosed the presence of a saclike cavity the size of a pigeon-egg with stratified epithelial lining and a well defined basal membrane. Most interesting was the arrangement of the cells of the submucosa: over most of the surface of the diverticulum these long connective-tissue fibrils were arranged longitudinally, while about the neck of the diverticulum they assumed an annular arrangement, suggestive of a sphincteric function. Evidences of inflammatory changes were present.

The second patient was a 38 year old married woman with 1 daughter, living and well. For several years the patient has been suffering from vague complaints suggestive of rheumatoid manifestations. For the past year the patient noted that the urine was turbid and exhibited traces of blood. However the bladder urine procured by catheterization was limpid. In this instance the diverticulum could be demonstrated by the chromocystoscopic method above described, and pus with traces of blood could be expressed.

The operation, essentially the same as that described for the first patient, resulted in the removal of a walnut-sized sac with walls a half centimeter thick. The epithelial lining was nearly all desquamated and lost. Elastic fibers and muscle fibers were scarce.

The third patient was a 61 year old housewife with a history of urinary incontinence and strangury. Here again the diverticulum could be demonstrated by the method of chromocystography. In this instance a collar-button calculus protruded partly into the urethra and partly into the diverticulum. The part of the stone protruding into the urethra could be broken off and removed through the urethra; however, the portion contained in the sac could not be so removed.

At operation the stone, together with the diverticulum, was removed by the method described. The operation did not cure the incontinence-of-effort but the patient refused further surgery, preferring to gain control of the urine by means of a ring pessary.

The arguments in favor of the congenital origin (urethral glands, duct of Gaertner, and duct of Wolf) are the sphincterlike histologic findings as described for the first patient, the location near the junction of the bladder and the urethra, and the position, always at one side of the midline of the urethra.

The chromocystic test is considered to be of particular importance since publication of the report by Willmarth of an ectopic ureteral orifice within a urethral diverticulum (*J. Urol.*, Balt., 1948, 59: 47).

—*John W. Brennan, M.D.*

Urethral Stricture Following Transurethral Resection Prevented by Internal Urethrotomy; Preliminary Report of Experience with Otis Urethrotome. JOHN L. EMMETT and JAMES R. WINTERRINGER. *J. Urol.*, Balt., 1954, 72: 867.

POSTOPERATIVE urethral stricture continues to be troublesome following transurethral resection, al-

though its frequency of occurrence has diminished sharply since the early days of this operation. Most strictures occur in the pendulous or scrotal portions of the urethra and they usually are tough, rubbery, resilient, and respond poorly to dilatation. The commonest site of stricture is the penoscrotal junction.

The principal cause of postoperative strictures is now generally agreed to be trauma to the urethra from instruments which are of too large caliber to be admitted easily by the urethra. Other possible etiologic factors include irritation from the urethral catheter, postoperative urethritis, trauma to the urethra at the point of junction of its movable and fixed portions (penoscrotal junction) from the up-and-down and side-to-side motion of the resectoscope, excessive heat generated in the sheath of the resectoscope, if the electrourethrotome is used, and a protracted period of operation. It is the authors' opinion that the causes of most postoperative strictures today are two: first, but probably of least importance, is inaccurate preoperative calibration of the urethra; second is the surgeon's hesitation to stop and do external urethrotomy when it is indicated.

Regarding preoperative calibration of the urethra, it is their opinion that minimal urethral narrowing at times may not be appreciated with steel sounds. Too often, in borderline cases, it is difficult to decide whether the sound actually dropped in of its own weight or was helped a little. More accurate calibration of the urethra is possible with the Otis metal bulbs (bougie à boule). The hesitation of the surgeon to employ external urethrotomy when it is indicated stems from the fact that he is anxious to get on with the operation; he dislikes to stop and lose part of the time during which the anesthesia can be expected to last.

It would seem, therefore, that if some simpler, safer and less time-consuming procedure could be devised which would overcome this troublesome problem, it would be a boon to both patient and surgeon. The authors believe that preliminary internal urethrotomy may be the answer to this problem.

There are two important indications for internal urethrotomy: (1) the presence of resilient strictures, especially those of the pendulous and scrotal urethra, which will not permit adequate dilatation, and (2) the need to enlarge the pendulous and scrotal urethra (either a small "normal" urethra or definite stricture) to permit the passage of large operating instruments, such as the resectoscope and the lithotrite, without the production of subsequent postoperative stricture. The authors consider it possible that internal urethrotomy gradually may replace perineal urethrotomy when transurethral resection must be performed through a urethra of small caliber. Whether or not this prediction is sustained will depend largely on care and scrupulous adherence to details by the surgeon, to prevent untoward complications. It must be remembered that, by internal urethrotomy, an opening may be made into large venous channels such as those of erectile tissue, permitting even more ready access of foreign material and infection into the general circulation than does the prostatic capsule during transurethral resection. Because of this, the same precautions shown to be effective in transurethral resection should be adhered to, namely, administration of antibiotics 24 to 48 hours before, and for several days after, operation as well as adequate care devoted to drainage by indwelling urethral catheter for at least 4 days. Such drainage permits the urethral incision to seal over, and prevents the patient's voiding into the general circulation via the cavernous tissue or an unhealed urethra. If such precautions are scrupulously observed, it is the authors' opinion that the procedure will prove to be of such minimal risk that it may be employed before transurethral resection whenever desirable.

Since the complete paper was presented, more than a year has passed. The authors now have had experience in a large number of cases, in the course of which they have been impressed with the favorable results obtained. This experience is the subject of a forthcoming report.

GENITAL ORGANS

Hemostasis of the Prostatic Bed After Enucleation of Cervical Adenomas: So-Called Prostatic Hypertrophy (Blutstillung der Prostataloge nach Enukleation der Blasenhalsknoten: sogenannte Prostatahypertrophie). Otto Hennig. *Zschr. Urol.*, 1954, 47: 477.

The anatomy and physiology of the vesical neck, according to Heiss' concept, is described; the pathogenesis of the prostatic hypertrophy is briefly discussed from the point of view of Reischauer and Moskowicz, who believe that the growth originates from cell complexes of the müllerian ducts. Studies of the anatomy, physiology, and pathogenesis reveal that following enucleation there is contraction of the "surgical" capsule, the inner lining of which consists of compressed smooth muscle fibers of sphincter loops and retractor uvulae muscle.

Although it is known, from roentgenologic investigations by Headstream and Marvin, that the hemostyptic retraction of the prostatic "surgical" capsule causes up to 50 per cent shrinkage of the prostatic bed immediately after the enucleation, two not entirely harmless procedures are still being done. One of these is attempted hemostasis by Foley's bag, which, in the experience of Goodyear and Beard, and Headstream and Marvin, has precipitated postoperative hemorrhage rather than prevented it. The other procedure is suture of the prostatic capsule (introduced by Harris, modified by Hryntschak), which may seriously interfere with the closing mechanism of the bladder outlet and may lead to strictures.

The author believes that a middle-of-the-road management consists of packing, following ligation or fulguration of individual vessels. In selected cases he still uses iodoform gauze, which is not removed before the third postoperative day, thus avoiding the "second sickness" of hemorrhage.

Reabsorbable sponges, gelfoam, or oxycel were first demonstrated in 1948 by Kielleuthner, but tenesmus and occlusion of the catheter occurred even when irrigation was carried out with a 5 per cent solution of sodium bicarbonate. A German sponge (spongioprat) led to complications such as tenesmus and calculus formation, which the author illustrates in the report of a case of his own experience.

A new German oxycel, sorbacel, has been developed which is neutral in contradistinction to its American counterpart; it is reabsorbed equally well in infected or aseptic surroundings, and has antiphlogistic properties. It is used by the author in suprapubic and ischial prostatectomies.

After suprapubic enucleation, topical hemostasis is done by irrigation (alexan, topostastin, thrombin-penicillin sponge or tuffon), the prostatic bed is well illuminated with the aid of a special lamp, sorbacel gauze is introduced into the cavity, and the bladder is closed primarily. Exceptionally a suprapubic cystostomy is done from a small trocar buttonhole, leaving the primary bladder suture undisturbed. The sorbacel gauze is kept in place by the bag of a Foley catheter. The cavity of Retzius is drained.

In cases of ischial prostatectomy, sorbacel gauze is introduced at both sides of the catheter following hemostasis under vision. The capsule is sutured and the ischiorectal fossa is drained. Sorbacel gauze liquefies completely and does not occlude the catheter.

The principle of artificial hypotension by ganglion blockade (hexamethonium bromide) has been used by the author (after initial hesitation) for suprapubic and ischial prostatectomies. The hypotensive effect is increased by positional ischemia, so that ligation of vessels is hardly necessary, but he uses sorbacel as a safety measure. Thrombi of opened vessels remain in place during the hypotensive phase, are not flushed out, and are gripped by the constriction of vessels as hypotension wears off. Thrombosis and embolism have not been observed. —*Ernest Bors, M.D.*

Epididymographies (Epididimografias). ARMANDO TRABUCCO, EVARISTO B. BOTTINI, and FERNANDO MARQUEZ. *Rev. argent. urol.*, 1954, 23: 205.

THIS PRELIMINARY REPORT was presented during the year of 1953 in the form of a lecture before the First International Congress on Sterility, in New York.

The technique of epididymography against the spermatic current consists of exposing, under local anesthesia, the ductus deferens at the level of the base of the scrotum, and injecting into it a water-soluble iodine preparation at body temperature. Even with the aqueous preparation, a rather high pressure (70 to 80 cm. Hg) is necessary to cause the opaque medium to permeate the lumen of the duct as far as the tail of the epididymis. The solution will not penetrate into the tubules of the tail of the epididymis in the normal organ without rupture of the finer tubules.

The patient is placed in ventral decubitus and the roentgenogram (50 milliamperes and 65 kilovolts), with the tube at a distance of 75 cm., is made as soon after the injection as convenient.

A series of 24 roentgenograms illustrate what can be anticipated from this method of examination. The first eight figures in the original article, as well as Figures 17 and 18, illustrate the epididymographic findings in normal testes. All these must be consulted in the original text where the exposures are bilateral. Figures 9 to 15 illustrate instances of obstruction of the duct.

Figure 16 (and the enlarged image in Figure 19) illustrates the result of injection in an instance of orchitis. It shows how much more completely and easily the finer tubules are injected in cases of healed infection of the epididymis. This is of both diagnostic and prognostic importance.

The remaining figures illustrate the effects of position and posture on the epididymographic findings. These studies were carried out on autopsy and orchidectomized specimens.

The authors are of the opinion that epididymography is a legitimate diagnostic measure in the affections located in the initial portion of the deferens, the tail of the epididymis and, at times, in the terminal portion of the corpus; however, they admit that one cannot dispense with other methods of examining the seminal passages (persufflation of the deferens and vesiculography). —*John W. Brennan, M.D.*

Spontaneous Torsion of the Ectopic Testicle (La torsione spontanea del testicolo ectopico). MARINO MINI. *Arch. ital. urol.*, 1954, 27: 15.

THE AUTHOR presents 4 cases of spontaneous torsion of the ectopic testis observed at the Surgical Clinic of the University of Bologna, Bologna, Italy, during the past 12 years. The author also bases his concept on a study of the medical literature.

The first instance was that of a 21 months old boy. Soon after birth it was noted that the scrotum was empty. Three days previous to admission a pigeon egg-sized tumor was noted in the left inguinal region. The patient began to exhibit elevations of temperature and attacks of vomiting. At operation the testis was found to have rotated intravaginally on its long axis through one complete revolution. It was tensely swollen and of a deep purple color. The torsion was undone, the congested and hemorrhagically infiltrated vaginal sac was excised, and the organ was brought down and fixed in the scrotum. Seven years later it had completely atrophied.

The second instance was that of a 15-year-old boy with rightsided inguinal testicular retention. Since early childhood this patient had suffered periodical attacks of cramplike pains arising in the right inguinal region and radiating to the abdomen, to the right flank, and to the right lumbar region. In the morning of the day of admission the pain did not subside but became severe, continuous, and was accompanied by vomiting.

At operation the testis on the right side was found rotated through three-fourths of a circle to be the size of a pigeon egg, and very dark (blackish) in color. The vaginal sac contained a moderate quantity of serosanguineous fluid. Orchectomy was carried out and the abdominal wall was repaired according to the method of Bassini.

The third instance was that of a 9 months old boy with bilateral chrptorchidism. About a week previous to admission the mother noted a walnut-sized, hard, painful tumefaction in the right inguinal region. During subsequent days the swelling increased in size and the pain became progressively more severe. At operation the testis was found to be rotated extravaginally through a three-quarters turn. It was reddish-blue in color and was transformed into an obviously necrotic mass. Orchectomy was done.

The fourth instance was, again, that of a 9 months old boy. Four days previous to admission he had be-

come restless and had vomited. One day previously the mother had noted a nonreducible tumefaction in the left inguinal region. Following this, neither feces nor gas had been expelled. The corresponding half of the scrotum was empty. On the right side the testis was apparently normal in size and location.

At operation the testis was found to be rotated through one complete intravaginal turn. There was a hemorrhagic infarction of the blackish colored organ and its epididymis. Orchectomy was carried out.

The two instances of extravaginal torsion are a part of 22 cases reported in the literature. In the 9 months old patient with the right sided torsion, the condition was that of the so-called dystopia inguinosuperficiale. It is the second instance of this type of testicular torsion reported in the literature; the other case of this type was reported by Souligoux (Bull. Mém. Soc. Chir. Paris, 1913, 39: 1136).

—John W. Brennan, M.D.

MISCELLANEOUS

Electrolyte Therapy in the Control of Uremia: with Special Reference to Postobstructive Uremia. Richard A. Neubauer and Lillian Dunsmore. *J. Urol.*, Balt., 1954, 72: 1074.

The problem of electrolyte control and the changes in blood urea nitrogen after alleviation of obstruction, dehydration, and infection are of real importance to the urologist. The authors discuss 10 cases in which the following conditions were observed: a fixed high blood urea nitrogen, a progressive uremia in spite of routine treatment, slow response to therapy, or intrinsic renal disease.

Therapy consisted of the administration of (1) intravenous glucose, 5 per cent, in water, with calcium gluconate added, and if indicated, potassium also; (2) 3 to 4 hours later, 120 to 240 milliequivalents of 1 or ½ molar sodium lactate, with 0.5 gm. of aminophylline given slowly, and this followed in 3 to 4 hours by (3) 1,000 to 1,500 c.c. of 5 per cent glucose in water, with 2 to 6 gm. calcium gluconate and 10 units of insulin.

The results of this regimen are good, in that all show a drop in blood urea nitrogen, and clinical improvement. Further investigation along the lines mentioned is advised. *—John R. Herman, M.D.*

The Results of Chemotherapy in Urinary Infections. L. P. Garrod, R. A. Shooter, and M. P. Curwen. *Brit. M. J.*, 1954, 2: 1003.

The authors state that their observations confirm previous reports that, despite the undoubted efficacy of modern antibacterial drugs, chemotherapy usually fails to sterilize the urine of patients with abnormalities of the urinary tract; furthermore, in the absence of a demonstrable abnormality a history of previous infection also reduces the likelihood of cure, although to a lesser degree. The treatment of patients with uncomplicated infections is more satisfactory, but the urine in an appreciable number of such patients will be infected immediately after treatment or a short time thereafter.

This study presents data concerning 1,022 infections of the urinary tract which occurred in 686 persons. The presence or absence of an abnormality of the urinary tract or history of previous infection of the urinary tract was noted in each case. The sensitivity of the infecting organisms to various drugs was determined by the agar diffusion method in primary culture.

Sulfonamides, penicillin, streptomycin, chlortetracycline, chloramphenicol, or oxytetracycline was employed in therapy. Although dosage schemes varied, of those patients who were given procaine penicillin, 83 per cent received 600,000 units or more daily, and of those who received crystalline penicillin, 94 per cent were given 1,000,000 units or more daily. Of patients receiving streptomycin, 28 per cent had 2 gm. or more daily, and 98 per cent had 1 gm. or more. At least 1 gm. of chlortetracycline was given daily to 98 per cent of the patients being treated with this drug. A daily dose of 3 gm. or more was given to 79 per cent of patients receiving sulfonamides.

Analysis of the length of treatment indicated that when penicillin was used it was given for at least 4 days in 90 per cent of the cases, chlortetracycline for at least 4 days in 93 per cent of cases, and sulfonamides for at least 4 days in 95 per cent of cases. All patients treated with streptomycin received it for at least 2 days. After-treatment specimens of urine were examined within 5 days of the end of treatment and follow-up specimens were examined 2 to 4 months later.

Bacteriologic studies indicated that of the 1,022 infections, 881 were due to a single organism, 133 to two organisms, 7 to three, and 1 to four.

Examinations of after-treatment specimens of urine indicated good results in patients without abnormalities of the urinary tract and without a history of previous urinary infection; 16 of 20 men and 157 of 178 women were cured. Therapy produced indifferent results in patients who had previously experienced infection of the urinary tract; 16 of 34 men and 118 of 159 women were cured. Therapy yielded poor results in patients with abnormalities of the urinary tract; only 39 of 116 men and 32 of 55 women were cured. The follow-up examinations of the urine confirmed these findings.

A clear relationship was noted between in vitro sensitivity of the organisms and the outcome of treatment, and the use of laboratory sensitivity tests is advocated to avoid the prescription of inappropriate drugs. No clear evidence was obtained that any one of the drugs used most often (sulfonamides, penicillin, streptomycin, and chlortetracycline) was superior to the others. *—Laurence F. Greene, M.D.*

The Effect of an Indwelling Catheter on the Bacteriology of the Male Urethra and Bladder. Ralph Shackman and David Messent. *Brit. M. J.*, 1954, 2: 1009.

In order to determine the nature of the bacterial flora in the urethra and bladder in the presence of an indwelling urethral catheter, and to determine the relationship, if any, between the organisms at the two sites, a series of urethral swabs and catheterized specimens of urine from 20 patients were obtained at daily or 2 day intervals and were examined bacteriologically. These studies were made prior to prostatectomy in 6 of the 20 patients and after prostatectomy in the re-

maining 14. The urethral specimens were taken on swabs from the fossa navicularis; the specimens of urine were taken simultaneously from the distal end of the catheter. To supplement the investigation, the nature of the bacterial flora also was determined in (1) the urethras of 9 male patients with urologic conditions and of 4 with nonurologic conditions not previously instrumented or catheterized; (2) the recently instrumented urethras of 11 patients, and (3) the urine passed either shortly before (midstream) or withdrawn at the time of insertion of an indwelling urethral catheter into 18 patients.

The studies indicated that the saprophytic organisms of the male urethra are staphylococci, Streptococcus faecalis, diphtheroids, Bacillus coli, Streptococcus viridans, and bacilli of the Proteus group. Prior to prostatectomy and in the presence of an indwelling urethral catheter, the Staphylococcus albus was the most frequent urethral organism. Similarly, after prostatectomy the most common urethral organism noted when an indwelling catheter remained was the Staphylococcus albus. The Bacillus coli, however, was almost as frequent. Thus, the main difference between the bacterial flora of the urethra before and after prostatectomy was the striking development of the Bacillus coli after prostatectomy. Finally, recent instrumentation did not appear materially to affect the nature of the urethral bacterial flora.

The study disclosed, further, that the presence or absence of organisms in the vesical urine prior to insertion of an indwelling urethral catheter did not appear to affect the nature of the bacterial flora which developed subsequent to retention of a catheter. In addition, the main difference between the bacterial flora of the vesical urine before and after prostatectomy was the marked development of Proteus strains after prostatectomy. Finally, little relationship was noted between the nature of the bacterial flora of the urethra and bladder when a urethral catheter was retained before prostatectomy. The relationship was closer, but by no means complete, after prostatectomy.

—*Laurence F. Greene, M.D.*

Persistence of Ancestral Renal Anlagen (Uberbleibsel von Urnierenanlagen). Otto Hennig. *Zschr. Urol.*, 1954, 47: 493.

This report deals with a 51-year-old man who had hematuria which was due to a small papilloma of the bladder. Urologic investigation at the time of the fulguration of the small tumor revealed the right ureteral orifice to be absent. The right kidney was also absent and in its place there were three calcified cystic structures. On the basis of reports of similar cases by Kempf, Oehlecker, Paetzel, Schintz, Baensch, and Friedel, the author concluded that these cysts were due to a remnant of the pronephros.

In each case in which such cysts were explored, they turned out to be thin-walled and had no vascular connection with the aorta or vena cava. A normal kidney on the corresponding side was always absent and the ureter usually ended blindly as a ureteral bud. Histologic section showed the calcified cysts to be simple in structure and consisting of a single layer of epithelium. In no case could renal rests or any resemblance to glomeruli or tubules be found. Radiologically such calcified cysts are usually multiple. They are arranged segmentally, one near or over the other; they are usually round or oval in shape, with sharply defined margins, and vary in size from that of a pea to that of a walnut or slightly larger. The cysts usually extend from the twelfth dorsal to the fourth lumbar vertebra. The upper margin of the top cyst is apt to be at the level of the eleventh or twelfth rib. Medially they extend to the transverse processes of the lumbar vertebrae. In the differential diagnosis echinococcus cysts of the kidney must be considered.

In summary, the calcified small cystic masses, which are undoubtedly persistent remnants of the anlagen of the metamorphosizing kidney, usually do not give rise to symptoms and are associated with the absence of the kidney on the corresponding side. These cystic masses have no vascular connection with the aorta or vena cava, and the ureter on the same side ends blindly or is absent.

—*S. Richard Muellner, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Observations on the Course of Skeletal Tuberculosis When Under Treatment with Anti-Tuberculous Medication (Beobachtungen ueber den Verlauf der Skelettuberkulose unter der Einwirkung der Tuberkulostatika). K. DAUBENSPECK and E. RAUSCH. *Zschr. Orthop.*, 1954, 85: 212.

IT IS IMPORTANT to realize that only large tuberculous foci are visualized on x-ray examination. The course of tuberculous coxitis depends largely upon the resistance of the body, the virulence, and the number of invading tubercle bacilli. Differentiation between a productive granulating type and an exudative caseous type of osteitis is important because it influences the course of the disease to a great extent. Occasionally both types are found in the same lesion.

At first tuberculous coxitis was treated conservatively. Aspiration of abscesses, cleaning out of sinuses, and positional osteotomy after termination of the acute process, which may take from 3 to 5 years, was usually the course of treatment. More recently, with the use of antibiotics the affected joint is opened much sooner, the focus is "cleaned out" and the localized lesion is drained.

Sixty-three cases of tuberculosis of the hip joint which occurred between 1945 and 1952 are reported. Seventy per cent of the patients were males. Draining sinuses were present in 65 per cent, and multiple tuberculous foci in 36 per cent. The average age at onset of the disease was 14 years. Twenty patients were treated conservatively, and in 30 arthrodesis was done. In 13 cases antibiotics were used locally and parenterally. There was 1 death due to amyloidosis and nephrosis. Bony ankylosis of the hip joint was obtained in only 40 per cent of the patients operated upon. Arthrodesis was successful in 70 per cent and doubtful in 17 per cent; arthrodesis failed in 7 per cent of the cases.

Operation was performed after an average period of 1 year from the time of onset of the disease. Arthrodesis was less successful in children; unsatisfactory immobilization was given as one of the reasons. The bone graft is not as sturdy in children as in adults. Ischiofemoral arthrodesis is to be preferred. The only contraindication to this procedure would be in instances in which the process is localized in the Y portion of the acetabulum, causing one part of the pelvis to be unstable, and preventing union of the bone graft to the pubic bone. It is important that a strong bone graft be used. The tibial graft from the unilateral side is usually decalcified and not too satisfactory. The bone graft must be securely anchored to the bony parts and, if possible, to sound bone. Occasionally abscesses are found around the operative site. These lesions may not necessarily contain live bacilli, and excision of the abscesses usually gives a very satisfactory result. In cases in which destruction of the head and neck of the femur is severe, the entire lesion is excised and then an osteotomy is performed to prevent upward dislocation of the shaft of the femur.

Arthrodesis of the hip joint is much more disabling than fusion of portions of the spine and therefore it is important to preserve motion in the hip joint whenever possible.

The author treated tuberculous infections parenterally with parateben. In 10 cases an average of 98.3 ampules of parateben were used intravenously and 54.8 grams of INH orally. In the synovial type of tuberculosis, no fixation is necessary and the injection of parateben was the only form of medication used.

In cases in which foci were recognized on x-ray examination, an attempt was made to incise and drain the lesions. This operation was used under an umbrella of concentrated parateben medication. A hip spica was used to immobilize the hip. In two-thirds of the cases so treated, inactivity of the process and full range of motion of the hip was obtained. It is therefore important that early diagnosis of tuberculosis be made. The lesions which are located close to the joint cartilage deserve particular attention. Cystic foci, more or less sharply outlined, without evidence of arthrosis deformans are most likely of tuberculous origin.

Thirty-four cases of tuberculosis of the knee joint were observed. Sinus formations were found in 11 and secondary lesions in 10 cases. The average age was 18.4 years, and the mortality was 9 per cent. Conservative treatment extended over an average period of 16.8 months. Double wire arthrodesis was found to be very satisfactory in cases of tuberculosis of the knee joint and in 10 of the 12 patients operated upon a solid fusion was obtained. It is important to excise the diseased portions of the bone, but it is not necessary to sacrifice too much of the healthy bone and thus cause a great shortening of the extremity. Bone grafts were used and these healed quickly and very satisfactorily. Fourteen patients were treated locally and intravenously with streptomycin and parateben. Foci close to the joint were excised, curetted out, and drained. In patients with a closed type of tuberculous arthritis parateben was injected into the joint. Satisfactory motion was obtained in 7 cases.

—George I. Reiss, M.D.

Contrast Media to Demonstrate Degeneration of the Intervertebral Disc Including Spondylosis Deformans (Das Kontrastbild der Degenerationen des Discus intervertebralis einschliesslich der Spondylosis deformans). A. N. WITT. *Zschr. Orthop.*, 1954, 85: 252.

DISCOGRAPHY DEMONSTRATES the nucleus pulposus and also indicates whether or not the annulus fibrosus is intact. The center of the intervertebral disc is usually occupied by the nucleus pulposus which is of mucoid elastic consistency. At an early age the nucleus pulposus is well circumscribed, but later fibers grow into the mass. As a rule the outline of the nucleus pulposus is very well preserved during the entire life span of the patient unless severe pathologic changes cause it to be

destroyed. The annulus fibrosus consists of many layers of fibrous tissue which give this structure a great deal of strength. The intervertebral disc is completely avascular in the adult. The water content of the nucleus pulposus is 88 per cent in children and drops to 68 per cent at the age of 75.

Discography is carried out in the following manner: the patient is placed in the prone position on the x-ray table. At the desired level the needle is placed perpendicular to the skin and parallel to the spinous processes at a point 1½ cm. lateral to the center of the spinous process. The needle is carefully introduced until an elastic resistance is felt. The needle then is driven into the intervertebral space and the contrast medium is injected. About 1 to 3 c.c. and not more than 4 c.c. are used. Anteroposterior and lateral films are taken. As a rule, 5 formations are noted: (1) the round nucleus, which indicates no pathology; (2) the multilocular nucleus (one single protrusion is considered normal); (3) the single branched nucleus (indicates herniation or the preliminary stage prior to herniation); (4) the multiple branched nucleus (indicates the presence of degeneration); (5) the flattened nucleus (indicates a severe case of degeneration and herniation is to be expected).

Herniation of the intervertebral disc may occur posteriorly. The prolapse may also cause a fracture into the vertebral body itself (Schmorls nodes). The picture of discography in spondylosis deformans and in cases of vertebral osteochondrosis is described and reproductions of roentgenograms are presented. Experience has shown that discography is a relatively harmless method and is a very useful procedure in the diagnosis of herniated intervertebral disc.

—*George I. Reiss, M.D.*

Considerations with Reference to the Diagnosis of Tumors of the Vertebrae (Consideraciones diagnosticas sobre los tumores vertebrales). P. Rubiés Trías and B. Plá Majó. *Acta ortop. traumat. iberica*, 1954, 2: 1.

Thirty-four cases of vertebral tumor together with a review of the literature form the basis for the opinions expressed by the authors. The material consists of 3 cases of hemangioma, 1 of giant cell tumor, 2 of chordoma, 1 of Paget's disease of the vertebrae, 1 of vertebral hydatidosis, 2 of Hodgkin's disease, 2 of myeloma, 4 of osteogenic sarcoma, 1 of angiosarcoma, 2 of reticulosarcoma, 2 of mammary cancer, 3 of prostatic cancer, 1 of gastric cancer, 5 of bronchopulmonary cancer, 1 of hypernephroma, and 1 of unknown nature.

These figures are not intended to be construed as an indication of the incidences of these tumors in the general population; many cases (notably of bronchopulmonary carcinoma) are referred by the internist directly to the radiologist without the patient ever seeing the orthopedic surgeon, except those instances in which there develops a gibbus, or a spinally induced loss of function of the spinal cord.

The early symptoms are predominantly motor in character and result from pressure on the cord (paraplegia); the pains are indefinite (rheumatoid) and are of little help in localizing the lesion; however, when the spinal roots are involved, the root symptoms are typical. The details of these findings belong to the realm of neurology.

The early radiologic findings are also not of much help in localizing the lesion; the authors agree with Snure and Maner (*Radiology*, 1937, 28: 172) that the roentgenogram fails to show any defect in most of these processes until the cortex becomes involved. In the majority of cases the benign process tends to infiltrate the trabeculae rather than destroy them; however, the honey-combed appearance of angioma is well known and a process such as Paget's disease of the vertebrae may be diagnosed by the involvement of the other bones of the skeleton.

The diagnostic value to be derived by securing biopsy specimens by exploratory lumbotomy, costotransversectomy of the dorsal spine, and other procedures is outweighed by the gravity of the procedure and the possibility of procuring "blank biopsy" specimens as a result of miscalculation of the level of the spinal section involved. Such objections do not apply so definitely to "puncture biopsy." Here the danger inherent in the method is negligible and, when employed routinely, should result in the solving of the problem in a large majority of instances. The technique of angiography as proposed by R. Dos Santos (*J. Bone Surg.*, 1950, 32-B: 17; *Internat. Abst. Surg.*, 1950, 91: 390) is mentioned favorably, although the authors have no evidence that the method has been attempted in the diagnosis of tumors of the vertebrae.

Of the malignant neoplasms of the vertebra, the sarcomas are usually of primary origin while the Ewing tumors and the reticulosarcomas are secondary (metastasis). In diagnosing the nature of metastatic lesions of the vertebra, and their radiosensitivity, the phosphatase test is of value; the osteogenic nature of the lesion is best determined by the increase in the titre for alkaline phosphatase; of diagnostic value in the vertebral metastases of carcinoma of the prostate is the appearance in the blood serum of acid phosphatase.

Malignant lesions of the hematopoietic system are, as a rule, brought to light more simply by puncture of the sternum and of the crest of the ilium than by attempting puncture of the vertebral corpus. Here also the diagnostic findings in the blood and urine may be easily recognized. —*John W. Brennan, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Ischemic Contracture of Volkmann; Treatment (La contractura isquemica de Volkmann; tratamiento). Juan Pruneda and Joaquin Herrera. *Acta ortop. traumat. iberica*, 1954, 2: 299.

A 16 year old boy, when 8 years of age, had suffered a fracture of the right elbow; a typical Volkmann's contracture resulted. In the course of the following 4 years two attempts were made at correcting the deformity of the elbow. Each attempt, by osteotomy and manual correction, was followed by a lengthy period of immobilization in a plaster cast, massage, manipulation, and hydrotherapy, each time without improvement. In the succeeding 4 years nothing in the way of treatment had been done.

On the authors' service treatment consisted in a preliminary extirpation of the head of the radius for fibrous radiohumeral ankylosis. Following this operation the patient recovered complete function of prona-

tion and supination of the forearm, and flexion of approximately 20 degrees.

A second operation was performed later in an attempt to correct the typical and persistent *main en griffe*. Through bilateral incisions 3 cm. of the radius and ulna were removed, from the middle third of the two bones. The radius was immobilized with an intramedullary Kirschner wire and the ulna with a Rocher nail. The resected portions of the ulna and the radius were opened into two troughlike halves apiece, and were fixed over the junction of the divided bones by several turns of stainless steel wire. The authors ascribe this technique, with slight modifications, to Fontaine, *et al.* (Reparatrice de l'appareil moteur. *Rev. chir. orthop.* Jan.–Mar., 1953).

The next day it was noted that the patient was able to flex and extend the fingers easily. Physiotherapeutic methods are being continued with the hope of obtaining an even more complete restoration of the functional power of the hand.

In this patient, apparently a considerable portion of the involved muscles had remained undamaged and functionally competent. The authors admit that in patients with total loss of functional power of the muscles, Parkes' operation of tendon transplantation may be indicated (*J. Bone Surg.*, 1951, 33-B: 3).

—John W. Brennan, M.D.

Bolting With the Fibula of Juvenile Epiphysial Separation of the Femoral Head (Bolzung der jugendlichen Epiphysenloesung des Schenkelkopfes mit Fibula). HEINZ BARTHEL. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 319.

AT PRESENT there are four general types of treatment for capital femoral epiphysiolysis: (1) immobilization of the affected extremity with the use of plaster, traction, or braces, (2) hormone therapy, (3) operative procedures to prevent further slipping of the capital femoral epiphysis and thus restore normal motion of the hip as quickly as possible, and (4) operative procedures to improve the position of the displaced bone by means of osteotomy, arthroplasty, or other methods.

In the treatment described by the author, the attempt is made to prevent varus position of the femoral neck, deformity of the head, secondary arthrosis, and extreme limitation of motion of the hip joint.

Howorth differentiates four stages of this condition: 1. The stage of synovial edema, hypervascularization, and perivascular infiltration with lymphocytes. 2. The stage in which the femoral epiphysis starts to slip; the epiphysis never completely separates from the neck and there is always a bridge of periosteum and connective tissue connecting the femoral head and neck. 3. The stage of callus formation; the proximal portion of the head and neck reveals absorption of bone but new bone is formed on the inferior aspect of the neck; solid union may not occur until the elapse of 2 to 3 years in certain cases. 4. The stage of malunion of the head and neck, with secondary changes in the synovial membrane, periosteum, and capsule.

With conservative therapy, degenerative and arthritic changes occurred within 5 to 10 years in the author's cases. Operative reduction failed in 47 per cent as a result of aseptic necrosis of the femoral head; in 50 per cent of the cases endocrine disturbances such as Froehlich's syndrome and pituitary gigantism were observed.

In view of the poor results obtained by the conservative approach, most surgeons use the method of internal fixation, i.e., the Smith-Petersen nail, in cases in which the slipping amounts to more than 1 cm., and an intra-articular osteotomy is necessary to re-establish proper alignment of the head and neck of the femur. Ombredanne and Albe used bone grafts instead of a metal pin. Bone grafts obtained from the tibia are absorbed very quickly and break very easily. Bone fragments, as described by Howorth, have been used. The hip is opened by means of the Smith-Petersen incision, channels are drilled on the anterior aspect of the neck and head, and bone grafts are taken from the iliac crest and placed in the trough. Excellent results are usually obtained within 4 to 5 months after surgery and no case has been reported in which necrosis of the head developed. The author uses a portion of the fibula as a bone peg and drives it across the epiphysial line into the femoral head. This operation was done in 3 cases of slipped femoral capital epiphysis. Re-examination of the patients after the elapse of 5 years revealed no shortening of the extremity. *—George I. Reiss, M.D.*

FRACTURES AND DISLOCATIONS

Treatment of Fractures of the Os Calcis with Subtalar Disjunction (Traitement des fractures du calcanéum avec disjonction astragalo-calcanéenne). J. JUDET and R. JUDET. *Acta orthop. belg.*, 1954, 20: 284.

THE AUTHORS propose a technique to re-establish the exact alignment of the subastragalar joint. The greater number of sequelae following fractures of the os calcis is due to dislocation at the subastragalar joint. Usually after the fracture of the os calcis this is in valgus, because its outer surface is more comminuted than the inner surface. The astragalus sinks into the posterior lateral aspect of the os calcis and the head of the astragalus appears in dorsiflexion, which causes diastasis of the astragaloscaphoid joint.

The reduction of the fracture of the os calcis requires the lifting of the astragalus from its sunken position, the correction of the valgus of the os calcis, and the maintenance of the astragalus over a well reduced articular surface. To obtain this, the authors use the following technique: the fracture is approached through a small incision below the peroneal tendons which are retracted forward together with their tendon sheaths. The outer surface is found to be greatly depressed and comminuted. There is a gap in the subastragalar joint and the inner surface of the astragalus appears less comminuted. In some instances the inner surface of the subastragalar joint appears intact.

The depressed portions of the joint surface are lifted into their proper places and the pieces of the external cortex are fitted together. They are held in place by means of a graft (4 cm. long and 1.5 cm. wide) fixed to the reduced lateral cortex of the os calcis, and a screw passing throughout the graft. The graft is applied over the outer surface of the os calcis, and the screw is inserted into the intact portion of the inner cortex or into the sustentaculum tali. In this manner

pressure is sustained between the graft, supporting the lateral cortex, and medial wall of the os calcis.

The x-rays have shown healing of the fractures in 70 to 200 days. No plaster cast is applied until 10 days after operation, then a circular cast is applied from the toes to the tibial tuberosity, with the heel excluded so that there is no pressure over the os calcis, and early varus-valgus motion is thus allowed.

Of 12 patients operated on, 11 had 50 per cent recovery of the subastragalar motion. In 1 patient there was complete ankylosis of the joint; 3 presented edema after weight-bearing; in 2 the screw was removed because it was not tolerated. —*Fernando Aleu, M.D.*

ORTHOPEDICS IN GENERAL

The Pathogenesis of the Anterior Tibial Syndrome (Contributo alla patogenesi della sindrome tibiale anteriore). ENZO RUGGERI. *Ann. ital. chir.*, 1954, 31: 448.

THE AUTHOR has carried out a detailed anatomic study of the vascular distribution in the lower extremity in order to find the etiology of the syndrome of ischemic necrosis of the muscles of the anterior tibial compartment sometimes seen in young people following a trivial trauma.

He studied by serial section the blood supply to the leg of seventh month fetuses, and injected the popliteal artery in several adults ranging from 17 to 60 years of age with a radiopaque medium in order to study the blood supply to the individual muscles.

The anatomic studies show that the point of greatest constriction of this compartment is in the middle third of the leg which is the critical area to be compressed when the muscles in that area contract forcibly or excessively to prevent the blood from going through and thereby producing an ischemic necrosis.

The inelastic nature of the anterior tibial compartment associated with the edema and spasm of an unusually severe muscular contraction may, in the author's opinion, result in prolonged ischemia and necrosis of either segments of the muscles or of the whole compartment. —*Alexander J. Conte, M.D.*

Recent Trends in the Treatment of Osteosarcomas (Tendances actuelles du traitement des ostéosarcomes). JACQUES LEBRUN. *Acta chir. belg.*, 1954, 53: 246.

IN 6 OF 23 PATIENTS with osteosarcomas, surgical treatment was followed by a survival of 5 years. These patients were treated over a period of 20 years at the Institute Bordet, in Brussels, Belgium.

The author observed that the possibilities of treatment and cure were much better in lesions of slower evolution. In 3 of the 6 surviving patients the first symptoms had appeared 1 year before the surgical treatment. This is explained by the different degrees of malignancy of the sarcoma.

Although, in the author's series, there seems to be no support for the theory that the local trauma of taking a biopsy will cause the onset of metastases, all patients who were given intensive radiotherapy after a biopsy had been taken developed serious local complications with rapid local extension, and in some instances amputation was necessary. Sometimes, however, a needle biopsy is possible.

The histologic pictures are difficult to interpret and, in the author's opinion, the roentgenologic image remains the most important means of diagnosis. Arteriographic films may show hypervascularization of the tumor.

The only surgical treatment of value is amputation or disarticulation.

Recently the author employed another routine for the treatment of osteosarcomas, with the thought of avoiding unnecessary mutilating surgery in cases in which a rapid extension of the tumor and metastasis are anticipated. From 5,000 to 6,000 roentgens are administered before any major surgery is performed. This dosage is followed by a period of observation. Some cases show an early generalization with rapid deterioration of the general condition. In these cases amputation is of no value. Other lesions will respond to roentgen therapy, the local and general condition will improve, and if within a period of approximately 6 months no metastases are discovered, the irradiation is always followed by amputation.

—*Joseph C. Mulier, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Traumatic Arterial Spasm and Thrombosis. W. Sterling Edwards and Champ Lyons. *Ann. Surg.*, 1954, 140: 318.

Important advances in the management of arterial injuries have come from the recent Korean conflict and the Second World War. It has been well established that arterial continuity can be restored in almost all cases of lacerated or divided major vessels by primary anastomosis or by arterial or vein graft. There remains the consideration, however, of the problem of vascular injury without laceration. Civilian injuries from blunt trauma, especially with fractures, are occasionally complicated by arterial spasm or thrombosis. Recent writers on this have advocated conservative management.

Experience gained through exploration of all injuries above the knee or elbow in which the peripheral pulse was markedly diminished or absent, has led to a different concept of their proper management. Gradually a definite plan of treatment has been evolved. All these considerations have led to the following plan of treatment for patients developing persistent diminution or absence of the pulse after injuries above the knee or elbow.

The injured artery should be explored as soon as possible after trauma if brachial block or spinal anesthesia does not cause a return of pulsation in a few minutes, even if some increase in skin temperature is noted. The perivascular sheath should be opened widely, and any hematoma evacuated. If the problem is spasm, local applications of warm saline solution, procaine, or papaverine should be tried. If a short area of spasm persists, this area should be resected and grafted. The finding of contusion or thrombosis warrants a primary resection of the injured area with a graft. No definite time limit should be set after which exploration will not be carried out. If retrograde flow can be obtained after the aspiration of a clot, the distal circulation can be restored. Saphenous vein grafts should be used in areas with muscular support, and arterial homografts in unsupported areas.

The mainstay of conservative management of arterial spasm and contusion has been sympathetic nerve block or sympathectomy. There are several reasons for not depending on sympathetic interruption alone. It has been shown that traumatic spasm of large arteries is not under sympathetic nervous control. Sympathetic block does not open up the main channel if spasm or thrombosis exists, and collateral vasodilatation is all that can be expected. This dilatation of the collaterals may be prevented by subfascial hematoma, or by extensive soft tissue injury. The propagation of thrombosis may block important collaterals so that their dilatation may be ineffective. Fasciotomy is of definite value in arterial laceration when a tense subfascial hematoma is constricting the arterial blood supply. In cases of complete arterial obstruction due to spasm or thrombosis, a similar firm swelling may occur as the result of intense edema of ischemic muscle. Here also fasciotomy may release the constricting envelope. There is another type of arterial constriction which is due to hematoma within the perivascular sheath. The possibility of such a hematoma and the ease with which it is released are added indications for thorough exploration of the area of arterial injury, even if hemorrhage is not a problem.

If thrombosis has occurred in a contused or spasmodic artery, the time factor is of especial importance for two reasons. First, complete obstruction of the arterial supply to a limb for 6 hours or less seldom leads to gangrene, whereas 12 hours of ischemia produced gangrene in about one-half of the cases. Second, distal propagation of thrombosis is certainly more extensive as time elapses with progressive interference with the collateral flow.

If there is a definite segment of thrombosis, yet the collateral circulation seems adequate to prevent gangrene, the problem arises as to the necessity of reestablishing the flow through the main channel. It is felt that this is desirable to prevent crippling claudication which results from segmental obstruction of the major vessels of the lower extremity. Obviously a patent arterial channel is far superior to one that is occluded. —*LeRoy J. Kleinsasser, M.D.*

Contribution to the Therapy of Arterial Embolism (Beitrag zur Therapie der arteriellen Embolie). Wolfgang Caithaml. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 494.

The author, of the Surgical Department of the University of Graz, Austria, discusses the treatment of arterial embolism of the extremities. The presence of arterial embolism is always an emergency situation. If treatment is not started within 8 to 10 hours, amputation can rarely be avoided. The reason for this is that, in addition to the mechanical occlusion of a large artery, an extreme spasm of the blood vessels proximally to the embolus develops, thus preventing blood supply by collateral circulation.

Surgical treatment includes embolectomy with or without subsequent sympathectomy, or sympathectomy only. These surgical procedures, however, are practicable in rare cases only because of the seriousness of the underlying heart condition (myocarditis, endocarditis, or other severe cardial damage).

The author believes that the best results are reached with a treatment limited to combating the vascular spasms and their sequelae by intravenous drop infusion with procaine, or panthesin and hydergin. The method is described in detail.

Procaine, 1 to 2 gm., and hydergin, 0.6 to 1.2 mgm. in 300 to 400 c.c. of saline are administered intravenously twice daily. In the later cases procaine was substituted by panthesin, 180 to 300 mgm., because of the lower toxicity of panthesin. In addition, paravertebral sympathetic block was applied twice daily. Furthermore, hydergin was applied subcutaneously

and, if possible, also intra-arterially. In the beginning, heparin was used in addition to the panthesin-hydergin therapy; this anticoagulant was abandoned later, however, because of the development of hematomas following paravertebral anesthesia.

Of 18 patients treated by this method, 12 recovered completely; in 6 cases amputation became necessary, after initial improvement. The failures consisted chiefly of cases in which the treatment had been started more than 24 hours after the embolism had occurred. —*Werner M. Solmitz, M.D.*

Experimental and Clinical Studies on Arterial Homografts and Heterografts Preserved in Alcohol; Preliminary Report. SEIJI KIMOTO, SABURO SUGIE, and MASAHIKO TSUNODA. *Arch. Surg.*, 1954, 69: 549.

THE AUTHORS PRESERVED arterial homografts in pure, or 70 per cent, ethyl alcohol at room temperature, and immersed them in isotonic sodium chloride solution containing penicillin before use. Aortic resections were done on 22 dogs with bridging of the defects with such homografts. Satisfactory results were obtained in 20 cases. Aortographic, macroscopic, and microscopic findings indicated results comparable to those of a viable stored or freshly prepared homograft in re-establishing the arterial circulation. All the transplanted vessels were replaced by the host tissues within 3 months, except for the elastic fibers of the media which remained at least 1 year.

Arterial heterografts were obtained from human beings within 2 to 4 hours after death, kept in pure or 70 per cent alcohol, and transplanted in dogs. In 19 of 21 dogs, results were satisfactory, with patent grafts and no disruption. Grafts were stored for more than 7 months. Results with viable arterial heterografts were not satisfactory, possibly due to antigen-antibody reactions.

These encouraging experimental results led to transplantation of arterial grafts stored in alcohol in 11 human cases. Homografts were used in 6 cases, and heterografts (dog and sheep) in 5 cases. Two operations in which bacterial contamination was present were failures. One patient died on the third day after operation from pulmonary edema. The remaining cases were successful, judging from arteriography. In 2 patients, removal of aneurysm of the abdominal aorta was accomplished.

Grafts preserved in 70 per cent alcohol were more effectively sterilized and regained their physiological softness more quickly than those preserved in pure alcohol. *S. Lloyd Teitelman, M.D.*

The Care and Treatment of Varicose Veins. H. O. MCPHEETERS and CLARENCE V. KUSZ. *Am. J. Surg.*, 1954, 88: 568.

THE AUTHORS STRESS the fact that varicose veins are a degenerative disease; the condition may be congenital, or may develop with the passing of the years.

Each patient must be considered as a separate entity and studied individually. Three essential steps in the treatment of varicose veins are: (1) adequate examination; (2) adequate surgery; (3) adequate follow-up care and treatment.

Examination consists of inspection, palpation, and percussion. A very careful history is mandatory. The symptoms of the condition are pain and cramps, the pain decreasing on walking and increasing on standing.

Ulcerations are common and recurrent. Usually they occur about the malleoli, especially the internal malleolus. The patient notes ankle edema near the end of the day. The skin is cyanotic. By palpation and percussion, the vein may be followed throughout the lower extremity. Perforators and incompetent communicating veins are sought.

Treatment depends on the extent of the disease. For small superficial varicose veins with no reverse flow, injection is often sufficient. For more extensive disease, with reverse flow from the saphenofemoral junction, through perforator veins, or from the junction of the short saphenous vein with the popliteal vein, a ligation at any or all of these places must be done. If the reverse flow is from the saphenofemoral junction but the varicose veins below are superficial and very tortuous, the authors believe that a high ligation with retrograde injection of a sclerosing solution is advisable.

If the varicose veins are very large in the thigh and lower leg, with reverse flow, high ligation and stripping of all the varicose veins is suggested. The authors believe that the main saphenous vein must be stripped down at least to the knee. For the patient with no incompetent perforators in the lower leg and varicose veins of only 1 to 2 cm. in diameter, the authors advise a high ligation with stripping to the knee and retrograde injection of a sclerosing solution. If segments of varicose veins in the lower extremity are extensive and 2 to 4 cm. or more in size, it is wiser to excise the veins in the area.

If infection has been present, it is often better to resect the entire area from the skin to the deep fascia or even to the muscle, with the skin resting on fascia or muscle. In extreme cases with repeated inflammatory attacks, the authors carry out a saphenofemoral ligation, complete stripping as far as is possible, radical excision of the degenerated skin down to and through deep fascia, with a split-thickness skin graft from the opposite thigh.

Immediately following surgery, support is applied to the lower extremity and maintained as long as necessary.

Patients must be seen regularly following surgery, and segments will have to be injected periodically. If perforator or communicating veins do open up and develop, they will have to be ligated.

—*Robert Paradny, M.D*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

The Postoperative Iron Level in the Serum (Ueber den postoperativen Serumeisenspiegel). MARTIN ZWICKER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 500.

THE AUTHOR, of the Surgical Department of the University of Berlin, Germany, studied the iron level in the serum following operative procedures.

The iron level together with the hemoglobin, and the erythrocyte and differential leucocyte counts were taken in 88 patients who underwent surgery for various conditions. Among these cases were 36 patients operated upon for malignant tumors. Blood examinations were carried out before and after the intervention, and the findings were tabulated in graphs. Altogether, 563 tests were performed in the 88 cases.

In all instances the author found a drop of the serum iron level whereas the hemoglobin and erythrocyte counts remained unchanged. The degree of the iron drop depended on the magnitude of the intervention. The climax of the iron drop occurred between the second and the seventh postoperative days. If the postoperative course was uncomplicated, the level returned to normal within 2 weeks.

The author assumes that the marked drop of serum iron, in spite of unchanged hemoglobin and erythrocyte counts, is a stress phenomenon due to surgical shock. He considers this as a centrally regulated process under the influence of the adrenal system and the hypophysis. —*Werner M. Solmitz, M.D.*

Experiences with Hydergin in Peripheral Circulatory Disturbances (Erfahrungen mit Hydergin bei peripheren Durchblutungsstoerungen). WOLFGANG CAITHAML. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 396.

THE AUTHOR, of the Surgical Department of the University of Graz, Austria, reports his experiences with hydergin (Rx) in a series of 167 cases of peripheral circulatory disturbances.

The chemical composition of hydergin is not revealed in this article. Pharmacologic investigations done by other workers have shown that hydergin lowers the tonus of the blood vessels and has a marked vasodilating effect; it acts on the vasomotor center as well as on the peripheral innervation of the blood vessels (adrenosympathicolytic effect). The drug is applied orally or parenterally. The recommended dosage is 1 sublingual tablet or 5 drops three times daily at the beginning. This amount is increased gradually by 1 tablet or 5 drops daily until a beneficial effect is noted. If necessary, the dosage can be as high as 6 tablets three times daily and may be continued for at least 1 to 2 months. Oral medication is supplemented by intramuscular injection two or three times weekly, depending on the condition. Occasionally the author used also intra-arterial injections. In some cases a maintenance dose of one tablet three times daily after termination of the treatment proved beneficial.

The 167 cases in which this method of treatment was used included 17 cases of endangiitis obliterans; 68 cases of arteriosclerotic disturbances; 16 cases of circulatory disturbances in diabetics; 8 cases of late sequelae of frost damage; 11 cases of peripheral nerve lesions; 32 cases of varicose veins; 12 cases of bone atrophy after fracture; and 3 cases of endangiitis of the cerebral vessels.

The treatment was successful in 150 of the 167 cases. The only group in which the prognosis was poor was that of patients with diabetes complicated by arteriosclerotic changes. In only 1 of 6 patients of this group could amputation be avoided. In all other groups enumerated, the hydergin therapy was equally successful. Beneficial effects were usually noted between the fifth and twenty-first day of treatment. Only if the treatment is continued long enough can an opinion be formed on its effectiveness. Some failures among the author's cases may have been due to too early cessation of treatment.

Seven of the author's cases are described in detail. In one of these the success was spectacular. A man of 27 years had been treated by other methods over a period of 2 months for beginning gangrene of the first toe, due to endarteritis obliterans. The treatment was unsuccessful, and the patient was admitted for amputation. At the time of admission the basal phalanx was black and necrotic, and the lower half of the leg was cyanotic and swollen. The arteriogram showed considerable conical narrowing of the main arteries which could not be visualized in the distal third of the leg. Although the patient himself asked urgentiy for amputation because of the excruciating pains, hydergin treatment in high doses (intra-arterial, subcutaneous, and oral) was instituted. After 12 days marked improvement was noted, and after 3 months the patient had recovered completely.

—*Werner M. Solmitz, M.D.*

Contribution to the Therapy of Surgical Shock with Whole Blood and Several Blood Plasma Substitutes (Beitrag zur Therapie des Wundschocks mit Blut und einigen Blutfluessigkeitsersatzmitteln). W. HEIM and W. OSTEN. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 453.

THE AUTHORS, of the Surgical Department of the Rudolph Virchow Hospital in Berlin, Germany, discuss briefly the physiology of shock after injuries, operations, the crush syndrome, and burns, and report their experiences with three colloidal, commercially produced plasma expanders. These were: macrodex (=dextran), peristone (polyvinyl pyrrolidone), and subsidon, a derivative of rutin.

A series of 47 patients who underwent major surgery was divided into five groups. Three of these groups received one of the three plasma expanders, the fourth received whole blood, and the fifth group

of 10 patients served as controls, receiving neither blood nor one of the blood substitutes.

The frequency and quality of the pulse and the blood pressure were examined every 5 to 10 minutes during the intervention, and every hour for the first 24 hours after the intervention. The laboratory tests included: hematocrit, blood volume, plasma protein concentration (Weichselbaum method), electrophoresis, viscosity, colloid osmotic pressure, and sodium and potassium content of the plasma.

Whereas this group of 47 patients did not receive any preoperative blood transfusions, another series of 66 patients who underwent very large operations and had shown marked anemia preoperatively received one or more blood transfusions before and, if necessary, during the intervention. The blood infusions were supplemented with one or a combination of two of the blood substitutes.

The authors conclude from their clinical observations and the laboratory findings that the first two substitutes mentioned were quite satisfactory as plasma substitutes. They were free of untoward side effects, they produced a lasting stability of blood volume, and enabled the organism to mobilize protein from the tissues into the circulation, thus increasing the blood protein level. The rutin derivative, subsidon, however, proved unsatisfactory because it caused extreme tachycardia, hyperhidrosis, and cyanosis in the majority of the patients.

The authors emphasize, however, that in shock due to marked loss of blood, whole blood is indispensable and far superior to any substitute.

—*Werner M. Solmitz, M.D.*

Fat Embolism Prophylaxis by Blood Pressure Reduction (Prophylaxe der Fettembolie durch Blutdrucksenkung). WILHELM FULAR and ERWIN KRAFT. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 548.

SHOCK AND DROP in the blood pressure following primary fat embolism are considered a purposeful response of the organism to prevent further embolic episodes. Therefore, contrary to prevailing opinion, the authors consider the administration of blood, adrenalin, sodium chloride, colloid solutions, or other supportive measures contraindicated in this state. Unless vital organs are involved any measure tending to raise the blood pressure is avoided. Experience has shown that provided the tension is kept at 100 mg. Hg., the body can withstand hypotension for several days without injury. When indicated, the blood pressure is raised gradually but is kept at 20 mm. Hg., below normal.

Novocain amide is completely satisfactory for producing hypotension. Prophylaxis is rarely carried out in patients with only minimal shock as a symptom of primary fat embolism. If indicated, novocain amide (4 c.c.) is given intramuscularly, 3 times daily for 4 to 5 days. Prophylaxis is applied for only 5 days since beyond that period the danger of secondary fat embolism is considered past. Patients in primary collapse are treated immediately by the administration of 4 c.c. of novocain amide given 5 times daily for a minimum of 5 days. No infusion or measures for the support of the circulation are given.

In severely injured patients and those in whom shock is complicated by severe bleeding, blood is administered, and, if necessary, operation is carried out very promptly. Transfusion is continued until the blood pressure is increased, when 2 to 3 c.c. of novocain amide are given every 5 hours. This is increased up to 5 c.c. 5 times daily for the next 4 days. When the blood pressure reaches 100 mm. Hg, a lytic mixture is infused. Megaphen, by its vasodilation, causes a drop in the blood pressure and should be given very slowly and under constant refill of the circulation. Once a certain stage of hibernation is reached the danger of hypoxia is obviated. Under these conditions only 10 c.c. of novocain amide per day, in divided doses, is given.

In a little more than 2 years there were 2,330 casualties and among them 1,464 fractures. For more than 1.5 years no patient sustained a secondary embolism, whereas for the year prior to the institution of prophylaxis there were 9 patients with embolism, some of them proved by autopsy. In addition, hypotension and hibernation therapy provides additional time for diagnosis, and the bleeding which was arrested during collapse is hardly increased despite the transfusion. If required, only small amounts of anesthetics are used and there is no stage of excitation.

—*Sidney Smedresman, M.D.*

Renal Failure Complicating Surgical Diseases (Laparotomy, etc.), with Special Regard to Conservative Treatment, and the Need for the Artificial Kidney (Dialyser, Ultrafilter) in Rational Renal Therapy; Acute Tubular Nephritis, Chronic Pyelonephritis, and Prostatic Hypertrophy with Urinary Retention. NILS ALWALL. *Acta chir. scand.*, 1954, 108: 95.

ACUTE TUBULAR NEPHRITIS (lower nephron nephrosis) is a common cause of acute renal failure, especially as a complication of surgical diseases.

The clinical course may be divided into four stages: (1) the stage during which the injury occurs (shock); (2) the stage of oliguria or anuria; (3) the stage of early diuresis; (4) the late stage of diuresis.

During the stage of oliguria or anuria, the author advocates conservative therapy, especially with regard to the nutrition and electrolyte fluid balance. His patients receive 2,000 to 3,000 calories daily in the form of 50 per cent glucose solution orally or intravenously to decrease protein catabolism, and thereby the uremia. The best method of following fluid-balance changes from day to day is to weigh the patient daily. Frequent roentgenograms of the chest are useful in fluid-balance control; pleural effusion is the earliest sign of fluid retention and a larger accumulation produces the "fluid lung." The author reduces fluid retention by induced diarrhea, followed by ultrafiltration of the blood in vivo, to remove the electrolyte surplus.

The control of hyperkaliemia necessitates study of the electrocardiogram and the determination of serum potassium, sodium, and calcium. Hypokaliemia occurs only rarely in the presence of anuria or oliguria, but can occur in the presence of renal failure in patients with gastroenteritis, paralytic ileus, and other conditions. In patients with hypoelectrolytemia, with subsequent fluid retention, induced diarrhea with hypertonic sodium or magnesium sulfate solution is of value.

If the patient manifests an acidosis he is given aluminium hydroxide orally to bind phosphates in the

intestine. If he shows an acidosis he is given ammonium chloride orally.

During the early stage of diuresis, tubular function is severely impaired, and much potassium, sodium and chloride is lost in the urine. These must be replaced and sodium bicarbonate given for the acidosis.

Artificial measures which can be used to treat uremia include exchange transfusions, intestinal lavage, peritoneal lavage, and the artificial kidney. When conservative therapy fails, dialysis is used. Usually 6 to 8 hours of treatment is sufficient to reduce the nonprotein nitrogen to below 100 mgm. per cent. The author regards such reduction necessary to obtain the best clinical result. Ultrafiltration treatment is used when it is impossible to alleviate life-menacing fluid retention by any other means.

Patients with chronic renal insufficiency—for example, chronic pyelonephritis—lose large quantities of urine as well as sodium and chlorides. In addition they tend to show acidosis.

Chronic pyelonephritis with uremia can be improved by forced fluid therapy, 10 to 15 mgm. of sodium chloride per day, potassium chloride, and sodium bicarbonate as necessary.

Patients with chronic pyelonephritis with acute exacerbations and uremia can be saved by dialysis followed by conservative therapy.

The results of therapy in 69 patients are presented, together with their case histories and blood chemistry values. —*Robert Paradny, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Initial Care of the Severely Wounded. Curtis P. Artz and John M. Howard. *J. Am. M. Ass.*, 1954, 156: 488.

The authors report on Korean experiences with resuscitation of battle casualties from the time of wounding, during and after operation.

First aid for the wound comprises arrest of hemorrhage and prevention of secondary wound contamination by a firm pressure dressing, assurance and maintenance of an adequate airway, occlusion of sucking wounds of the chest, and splintage of fractures of the extremities.

First aid for the patient comprises support of the failing circulation through administration of albumin or plasma volume expander. Dextran in plastic bags was an efficient means of providing intravenous colloid solutions in the field, in preparation for and during transport. The first physician who ministers to the casualty assures the patient regarding anxiety over extent of the injury, and assures himself that hemorrhage is controlled, that respiratory exchange is adequate, and that splintage of extremities is satisfactory. Morphine is used only if severe pain is clearly present and it is always administered intravenously.

The patient is prepared for further evacuation and transportation by infusion of additional serum albumin or plasma volume expander, in amounts commensurate with the severity of the injury. On arrival at the hospital the wounded man is given a rapid but thorough physical examination, and a record is made of the findings, including assessment of the overall injury, extent of vascular, nerve, and bone involvement, and blood pressure and pulse rate. Tetanus antitoxin or a booster dose of tetanus toxoid is given. Antibiotic therapy is instituted to prevent the spread of infection, and the initial doses are added to the intravenous fluids given to assure therapeutic blood level concentrations. Oxygen by nasal catheter is indicated if cyanosis is present, respirations are labored, or the blood loss has been massive. All patients with abdominal wounds should have an intragastric tube. Blood volume deficiency is corrected as rapidly as possible, with use of a 13, 15, or 17 gauge needle and several veins, simultaneously if necessary. Vein cut-down and cannulation with a plastic tube may be in order. In Korea, low titer type O blood without crossmatching was used almost exclusively with satisfactory results and negligible untoward reactions.

The amount of blood needed to prepare the patient for surgery varies from patient to patient. The surgeon's guides to adequacy of restorative treatment in the absence of continuing hemorrhage, pneumothorax or hemothorax, central nervous system injury, or anoxia from blockage of the respiratory passages are improvement of the general appearance of the patient, the color of the conjunctivae, a blood pressure stabilized at 110 mm. Hg., and a pulse rate below 120 per minute. Adequacy of visceral blood flow can be estimated by the rate of urine formed. In a severely wounded man, a catheter in the bladder is a valuable aid; a urinary flow of 30 c.c. or more per hour suggests that the circulatory volume is approaching normal. If movement of the patient to the operating room or x-ray table is not attended by deterioration of vital signs, he is usually ready for operation; otherwise he probably still has an appreciable blood volume deficiency. Common causes of continuing hypotension are concealed hemorrhage in the abdomen or chest, cardiac tamponade, and tension pneumothorax.

In patients with multiple injuries, it is necessary to determine priority for the site of operation. The area of massive hemorrhage should receive attention first; thereafter, priority should be given to the chest, abdomen, head, and extremities, in that order.

After operation it is imperative that the patient be examined frequently for evidence of blood loss, pulmonary complications, gastric complications, and distended bladder. Frequent observations of the blood pressure and hourly measurements of the urine are essential guides to therapy. A patient who is hypotensive after operation and does not excrete urine probably has a blood volume deficiency and further replacement is required. In Korea the majority of severely wounded men who recovered required 5 to 20 pints of blood in the first 24 hour period following injury; others required more blood. Cautious trials indicated that dextran could be safely alternated with blood in a ratio of 1 to 2. In Korea the mortality rate for persons who had abdominal wounds was about one-half the mortality rate for a comparable series in World War II. The use of massive transfusions seems to be the predominant contributing factor. In a group of 138 wounded persons who required from 5 to 56 pints (2,838 to 26,488 c.c.) of blood in the first 24 hours after injury, the mortality rate was 14.5 per cent. Impressions gained from a limited study were that blood infused by the intra-arterial route was of no

more value than blood infused by multiple intravenous routes. —*Edwin J. Pulaski, M.D.*

Traffic Accidents from the Surgeon's Viewpoint (Ueber Verkehrsunfaelle aus der Sicht des Chirurgen). K. H. BAUER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 279: 141.

IN HEIDELBERG every seventh bed, and in Frankfurt every fourth surgical bed is occupied by a patient who sustained injuries in a traffic accident.

In comparison with 1948, the number of industrial accidents in 1952 rose 64.5 per cent while that of traffic accidents showed an increase of 151 per cent. While the incidence of street car and railroad accidents remained stationary, the number of accidents among automobile drivers rose 147.4 per cent, among bicycle riders 269.6 per cent, and among motorcycle riders 338.6 per cent.

Close to 4 per cent of industrial accidents were fatal, as compared with 15.5 per cent of traffic accidents.

Injuries of the head and extremities were registered in 84.7 per cent of all personal injuries in car accidents. Skull injuries occurred in 40.5 per cent of the entire series and were responsible for 70.8 per cent of all car accidents, 78.2 per cent of all bicycle accidents, and 79.2 per cent of all motorcycle accidents. Abdominal traumas were combined with other injuries in 90 per cent of cases and showed a mortality of 60 per cent.

In 1951, in Heidelberg, there were 17.2 traffic accidents per 1,000 citizens. To reduce the appalling number of injuries, the author suggests the compulsory wearing of protective helmets by motorcycle riders, the use of safety belts, some sort of protective caps for car drivers, and rubber lining of dashboards and roofs of automobiles. If the cars run 25 miles per hour, an unobstructed view should be provided at crossings for a minimum distance of 28 yards. Underpasses should be constructed at dangerous crossings.

Since the elimination of the speed limit in 1953, the number of personal injuries in automobile accidents has increased 43.7 per cent, and the mortality 49.7 per cent. —*Joseph K. Narat, M.D.*

Histopathologic Changes in Experimental Thermal Wounds. PHILIP B. PRICE, DEAN E. CALL, FARREL L. HANSEN, and CALVIN J. ZERWICK. *Surgery*, 1954, 36: 664.

FOUR TYPES of experimental burn have been studied. Burns were produced in dogs, and in creating the burns an effort was made to reproduce the kinds of thermal injury that are most commonly seen clinically.

The burns were produced with hot metal at 70 degrees C., with steam at 95.5 degrees C., with alcohol flame at about 750 degrees C., and with exploding gasoline vapor and oxygen at 2,900 degrees C. The burns were limited to small circular areas 4 to 5 cm. in diameter.

The gross and histologic characteristics of these experimental burns are described. The most severe injuries were caused by steam and flame burns, the least severe by gasoline explosion flash burns. Grossly the hot metal, steam, and alcohol burns progressed from little or no change in the first two, and from cooked lifeless or charred brown skin in the latter, to ulceration in 2 to 6 days. The exploding gasoline vapor progressed from singed hair to healing, usually without any skin loss. Microscopically it was seen that in addition to the immediate tissue damage which thermal trauma appeared to initiate, at levels too deep to be reached by destructive amounts of heat, progressive cellular deterioration resulted finally in extensive necrosis and ulceration. The nature of that destructive process is not well understood and no clue to its cause could be found on microscopic section.

In burn wounds, the processes of destruction and repair appeared to coincide and be competitive. Because very little vascular damage in the nature of thrombosis was found and because relatively little heat actually penetrates the skin and its underlying tissue, further studies were conducted to determine the effects of heat on blood itself.

A dog's femoral artery and vein were connected by means of a long polyethylene tube. This tube was then immersed in a water bath so that the flowing blood could be heated to any desired degree in transit and then be returned to the animal's general circulation. When no anticoagulant was used the blood could be raised to 55 degrees C. without clotting. With heparinization, temperatures of 60 degrees C. could be reached without symptoms other than those of slightly increased body temperature. If the tube was heated and then cooled before the blood returned to the circulation, no effects were noted. Hemolysis devoloped slowly. When high degrees of temperature were reached with this technique, such as boiling water in the bath, this animal soon developed hyperpyrexia, severe dyspnea and convulsions, and died. In view of these observations it is questionable whether heating of "trapped" blood per se in burn wounds is an important factor, either in progressive deterioration of the injured tissue or in the development of postburn anemia.

A finding of possible importance is that burned epidermis, so long as it remained an unbroken surface, seemed to serve as an effective barrier against bacterial invasion. —*Edmund R. Donoghue, M.D.*

The Blood Protein Picture in Burns with Special Reference to Pancreas Enzyme Treatment (Das Bluteiweissbild bei Verbrennungen unter besonderer Berucksichtigung der Pankreasfermentbehandlung). K. STUCKE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 603.

IN SEVERE BURNS immediate removal of all necrotic tissues is essential to prevent or reduce intoxication of the organism by substances like putrescin, cadaverin, indol, and other products of protein disintegration. The effectiveness of primary surgical excision of necrotic tissue is limited, and the intervention presents additional trauma for a patient who is in shock from the injury. Elimination of the necrotic tissue by digestion with pancreas enzyme has shown much better clinical results than surgery.

The author, of the Surgical Department of the University of Wuerzburg, Germany, studied the changes in the blood picture of dogs before and after scalding by steam. Part of the animals were treated immediately after the scalding by the application of a mixture containing 1 per cent pancreas enzyme and 50,000 units of penicillin per 100 c.c. The following tests were done before and in weekly intervals after

the experimental scalding: albumins α, β, and γ globulins, total protein, colloid osmotic pressure, hemoglobin, hematocrit, prothrombin time, and recalcification time to determine the total complex of clotting factors. The same tests were applied in another group of animals which served as controls, not receiving pancreas treatment after the scalding.

The following conclusions were drawn from the author's experiments:

During the first 24 hours marked loss of plasma occurs, as proved by the rise of the hemoglobin and hematocrit count and the sharp drop of total protein. The acute transudation of plasma not only in the area of the burn but generally in the capillaries of the extremities and the trunk is also demonstrated by marked edema of the extremities and the abdomen. In cases that came to autopsy shortly after severe burns, the internal organs also showed considerable edema. It has been assumed that these generalized edemas are due to damage of the arterioles and capillaries by anoxemia.

Marked anemia developed in all cases, probably because of invasion of toxins and hypalbuminemia. In the animals treated with pancreas enzyme the hemoglobin started rising again 1 week earlier than in the controls.

As in most diseases which cause disturbance in the protein metabolism, an increase of the globulins at the expense of the albumins occurs after burns. The drop of the total protein amounts to from 5 to 10 per cent during the first week; the albumins dropped by about 30 per cent relatively, whereas especially the α-globulins rose by about 5 to 15 per cent, relatively, i.e., they increased by about 70 per cent of their original level. The β- and γ-globulins did not show any significant difference in the beginning; from the second to the fifth week, however, the γ-globulins rose whereas the α-globulins decreased.

The return to normal showed a significant difference in the animals treated with pancreas enzyme when compared with the control animals. Whereas the total proteins started rising only after 3 weeks and reached the original level after 4 weeks in the controls, the treated animals showed an increase after 1 week, and the original level was reached after 2 weeks. The albumins were restored much more slowly than the globulins, reaching the original level in the twelfth week only.

A similar difference between the treated and untreated animals was found in the colloid osmotic pressure. The original level was reached in the treated animals after 4 to 5 weeks and in the controls after 6 weeks.

A prolonged clotting time with increased prothrombin and recalcification time was found in all animals. No difference in this respect was found between the treated animals and the controls.

—*Werner M. Solmitz, M.D.*

A 5 Year Report on the Treatment of Burns. GERALD O'BRIEN and RICHARD D. MURRAY. *Plastic & Reconstr. Surg.*, 1954, 14: 271.

THE AUTHORS review 992 cases of in-patient burns treated at Kings County Hospital, in Brooklyn, during the years 1949 through 1953. A brief outline of the method of treatment is given together with a listing of all deaths and summaries of all autopsied cases. There were a total of 45 deaths and 8 autopsies. It is believed that the critical percentage of burned surface is somewhere in the neighborhood of 35 to 40 per cent for third-degree burns.

A patient suffering with burns enters the hospital where he is seen by the resident staff in the admitting ward. Should the burn involve 10 per cent or more of the body surface, fluids are started immediately, plasma is ordered and started, and the patient is typed and cross-matched for whole blood administration. The burn is evaluated as to extent and depth and an appropriate chart is filled out for each patient. The evaluation follows a precise plan which is as follows: buttocks and lower extremities, 38 per cent; trunk and neck, 38 per cent; upper extremities, 18 per cent; and head, 6 per cent.

The amount of colloid used depends upon a previously worked out formula: the percentage of body surface burned times the patient's weight in kilograms, times 1 c.c. During the first 24 hours the colloid is made up of 25 per cent plasma and 75 per cent whole blood. An equal amount of electrolytes is also given. A careful record of intake and output is maintained. For every 1 c.c. of normal saline solution, 2 c.c. of 5 per cent glucose in water are also given. During the first 6 hours the patient should receive half of his total fluid requirements. During the next 6 hours he receives a fourth, and during the next 12 hours he receives the other fourth. On the second day he receives a half of the total amount as calculated for the first day, and on the third day and thereafter blood and fluids are given as indicated. The patient is also encouraged to take fluids by mouth—particularly the following formula which can be given with fruit juices, ice, or sugar: 2 gm. of sodium chloride and 1 gm. of sodium bicarbonate contained in 1,000 c.c. of water.

The authors have found that the patients do infinitely better when they receive blood early and in large quantities. Immediate hemoglobin, hematocrit, and total protein determinations are drawn. Routine blood chemistries are also obtained daily. These include the following: carbon dioxide combining power, sodium and potassium, blood urea nitrogen, and blood sugar.

A cod-liver oil ointment dressing is applied beneath semipressure dressings. The cod-liver oil ointment produces a chemical débridement by liquefying the slough. The open method has been used advantageously in a few selected cases. Most of the burns have been of circular involvement and have not responded well to the open method of treatment. Demerol is given for pain.

The use of homografts, once the burn has sloughed, has been found to be particularly effective. Many patients who might otherwise have been lost have been salvaged by the use of homografts as temporary burn dressings. In the authors' experience, homografts survive approximately 3 weeks.

The critical point which spells the difference between life and death has been found to be somewhere between 35 and 40 per cent of the total body surface burned, in third-degree burns. This again is dependent

upon many factors such as age, general medical condition, and resistance to infection. If a patient survives through the third week, the chances of eventual survival are enhanced. By that time the second and first-degree burns are healed, and skin grafting has been instituted. Elderly patients often have other ailments in association with their burns that decrease their chance of survival.

Several signs indicate a poor prognosis. The appearance of jaundice indicates severe liver damage. The livers of jaundiced burn patients examined post mortem indicated a severe degree of damage. It is believed that burns are hepatoxic in themselves. A kidney shutdown also indicates a poor prognosis, for lower nephron nephrosis is not uncommonly seen in burn patients. A tremendous hemolysis of red blood cells occurs in burn patients. Toxic psychosis occurring in the course of burn therapy indicates a poor prognosis. These patients are difficult from the management point of view.

Twenty of the 45 deaths occurred in patients with burns of more than 40 per cent of the body surface; 20 deaths occurred in patients who were 65 years of age or older. The oldest patient was 92 and the youngest, 5 years of age. Complications or pre-existing diseases were present in 22 cases. Burns in association with Parkinson's disease appeared to be particularly lethal because of an associated hyperthermia and a lack of resistance to infection.

The authors list all 45 of the deaths, together with the percentage of body surface burned and other complications or pre-existing disease. Following the list of all deaths, the posted cases were summarized together with autopsy findings. In 5 of the 8 instances in which autopsies were done, varying degrees of liver damage were found.

This is an interesting summary that should be perused by those interested in the treatment of burns. —*F. W. Pirruccello, M.D.*

The Combined Effects of Thermal Burns and Whole-Body X-Irradiation: Anemia. A. K. Davis, E. L. Alpen, and G. E. Sheline. *Ann. Surg.*, 1954, 140: 726.

In carefully planned studies on anemia, utilizing rats, the authors have employed multiple tests with several combinations of thermal burns and whole body x-irradiation.

Rats subjected to both 15 per cent and 25 per cent body area burns showed a persistently elevated blood plasma volume, sustained reticulocytosis, and normal cell volume indicating the destruction of erythrocytes during the post-burn period. In rats exposed to 500 roentgens of ionizing radiation, a severe anemia developed, with a concomitant fall of all measured values for 15 days. Rats given a combination of both thermal burn and x-irradiation demonstrated somewhat more pronounced findings, though of a similar nature. The measured alterations depend on whether the given trauma is mainly that of thermal burn or x-radiation. In combined injuries, the effect of the x-radiation is best noted by a failure of reticulocytosis. Rats with a 25 per cent thermal burn, given sublethal radiation, developed a progressive anemia and characteristically died before the fifteenth day. —*John C. Carlisle, M.D.*

Traumatic Subcutaneous Lymphorrhagia (Su di un caso di linforragia sottocutanea traumatica). Luigi Rovati. *Ann. ital. chir.*, 1954, 31: 237.

The author reports a case of traumatic lymphorrhagia in a 46 year old male who sustained an injury to the left thigh when hit by an automobile. A swelling noted on the medial aspect was aspirated on two occasions, but without improvement, and the patient was hospitalized 22 days after the accident. In the hospital he was treated by repeated aspirations and subsequent injection of 4 c.c. of a sclerosing solution (Calot's). Altogether he had 12 such treatments over a period of 54 days, when he was discharged as cured. A diminishing amount of fluid was obtained—from 160 c.c. at the first aspiration to no fluid at the last attempt. The fluid (a reddish-yellow color) formed a soft clot on standing. A centrifuged specimen revealed many lymphocytes, a few red blood cells, and rare polymorphonuclear cells.

A pressure bandage was applied to the thigh after each treatment.

A review of the literature on the subject is presented. The condition is believed to be due to a lowered local resistance of the lymphatic vessels in the area damaged by the traumatic force.

—*Lucian J. Fronduti, M.D.*

Local Tetanus. A. Henry Millard. *Lancet*, Lond., 1954, 2: 844.

Local tetanus may present itself in one of three forms: (1) purely local; (2) local but later becoming general; and (3) primary general becoming secondarily localized. Purely local tetanus is rarely lethal. It arises when there is present in the blood stream enough tetanus to neutralize the circulating toxin, but not enough to prevent local accumulation of toxin in or near the wound. The toxin is thought to be absorbed from the motor end plates, both locally and through the general circulation, to spread proximally within the nerve sheath or along the axons to reach the anterior horn cells, where it is "fixed" and rendered inaccessible to antitoxin.

The author describes a case of tetanus in a 22-year-old male which occurred following a deep, dirty wound of the left buttock from a sharp object. The wound was débrided and left open, and antitetanic serum, penicillin, and streptomycin were given. A deep subgluteal abscess developed which was drained 11 days after the injury. Fifteen days after wounding, intermittent painful spasms began, extending from the left buttock and down the back of the thigh and into the calf. The left knee was fixed at almost a right angle and the left foot was strongly plantar-flexed with clawing of the toes. Attempts at either active or passive motion of the limb induced further painful spasm. The patient was afebrile, and the original wound clean and almost healed, as was the site of the drained abscess. There was neither trismus nor neck rigidity and the symptoms were confined to the left leg and to the distribution of the sciatic nerve. Gradual improvement followed standard antitetanus therapy, the clonic contractions having ceased entirely 16 days following the initial symptoms. Full function of the limb was eventually obtained, but prolonged physical therapy was necessary. The author

emphasizes the importance of prompt recognition of local tetanus, vigorous therapy with antitoxin, sedatives and relaxants, and the lengthy duration of the tonic spasm during the recovery period, which is important to treat since permanent disability may occur.

—*Edwin J. Pulaski, M.D.*

Treatment of Tetanus; with Curarization, General Anesthesia, and Intratracheal Positive-Pressure Ventilation. H. C. A. LASSEN, MOGENS BJØRNEBOE, BJØRN IBSEN, and FRITS NEUKIRCH. *Lancet*, Lond., 1954, 2: 1040.

THE DEVELOPMENT of tetanus in some cases becomes extremely severe, and complete curarization is the only means of preventing sustained convulsions. The authors, drawing the corollary between bulbar poliomyelitis and the use of tracheotomy and positive pressure ventilation with the curarized state, undertook this method of treatment in 4 cases. In each instance it was impossible to control the severe, persistent convulsions and spastic state by adequate sedation with one of the barbiturates or chloralhydrate, and the clinical state was deteriorating as evidenced by the presence of hyperpyrexia, cyanosis, and tachycardia.

The usual treatment of excision of the wound, tetanus antitoxin, penicillin, and tracheotomy had been accomplished in each instance; however, the progression of the disease indicated that some additional measures were necessary to prevent an ultimate fatal outcome. The case histories of these 4 patients are given in detail. There were 3 children, aged 10, 11, and 15 years, and an adult 50 years of age. The incubation periods in the children were short, being 5, 10, and 4 days, whereas, in the adult, the incubation period was 9 days. In one instance it was necessary to maintain general anesthesia with nitrous oxide and oxygen combined with barbiturate for a total of 17 days. In 3 of the 4 patients, the recovery was complete after 2 to 4 weeks. The curarizing agent used was d-tubocurarine chloride which was administered by continuous intravenous drip. Manual respiration through a cuffed endotracheal tube and a to-and-fro absorber system were used to maintain adequate ventilation. The patient who succumbed died of a generalized septicemia with multiple small abscesses in the viscera. In 2 patients myocarditis, and in 2 granulocytopenia and thrombocytopenia developed.

The treatment of 4 of the patients who had severe tetanus is described. It consisted of total paralysis by curare, long continued general anesthesia with nitrous oxide-oxygen, and the maintenance of adequate ventilation with endotracheal positive pressure respiration.

—*Jerry A. Stirman, M.D.*

Results and Conclusions of Serum Titer Determination in Simultaneous Tetanus Prophylaxis (Ergebnisse und Schlussfolgerungen der Serumtiterbestimmung bei der simultanen Tetanusprophylaxe). E. MÖRL. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 279: 209.

THE AUTHOR DISCUSSES the results of combined active and passive tetanus prophylaxis in persons who had not previously been immunized with toxoid. The serum antitoxin titer was tested daily; a level of at least 0.2 antitoxin units per cubic centimeter was considered as effective protection.

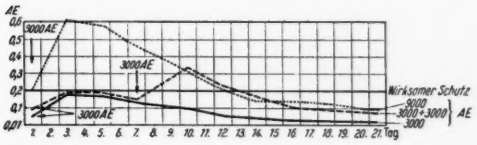

FIG. 1

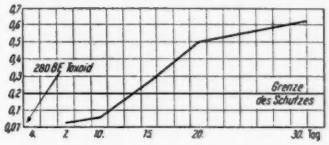

FIG. 2

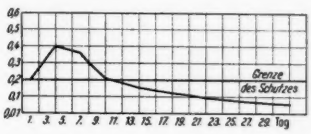

FIG. 3

FIG. 1. Serum antitoxin levels after passive immunization with 3,000 antitoxin units, two times 3,000 units in an interval of 7 days, and 9,000 units. Lowest protective titer is 0.2 antitoxin units per 1 c.c. of serum.

FIG. 2. Serum antitoxin curve after active immunization with 280 units of native toxoid (French anatoxin). Limit of protection (at least 0.2 units per c.c. of serum) is reached on the 12th to 14th day, on the average.

FIG. 3. Actual diagram of serum antitoxin levels in simultaneous prophylaxis (simultaneous, topically separate injection of 9,000 antitoxin units, and 280 units of native toxoid in 20 persons). Mutual influence between passive and active vaccines causes the passive curve to be shallower and shorter; an actively produced titer is not demonstrable up to the 30th day.

Passive immunization with 3,000 units of antitoxin produces effective immunization for 7 days only. If the injection of 3,000 units is repeated after an interval of 7 days, an effective antitoxin level was maintained for 14 days. The same result was reached when only a single dose of 9,000 units was given.

Active immunization with native toxoid (anatoxin), as it is used in France, produces a rising of the antitoxin level after 12 to 14 days, whereas, after alum-precipitated toxoid an effective level is reached only after 4 weeks at the earliest.

Ramon and other authors have suggested the production of a combined active and passive immunization by the injection of antitoxin and native toxoid (anatoxin) at the same time, at different sites. The author treated 20 patients by this method and determined their serum antitoxin titer daily for 30 days. The results were quite unsatisfactory. Only for the first 10 days was an effective titer of more than 0.2 unit present, and no success of active immunization could be detected up to the thirtieth day.

The cause for this failure is the fact (already stated by Paul Ehrlich) that toxoid reacts with antitoxin and immunization is inhibited. The author's experiments proved that simultaneous prophylaxis lowers the degree and shortens the duration of passive protection whereas active antibody production cannot set in as long as passively produced antitoxins are present in the serum.

The method of simultaneous prophylaxis should, therefore, be discouraged.

—*Werner M. Solmitz, M.D.*

On the Permanence of Antitetanus Immunization. Edward S. Stafford, Thomas B. Turner, and Leon Goldman. *Ann. Surg.*, 1954, 140: 563.

In recent years an increasing portion of the population of the United States has been actively immunized against tetanus toxin. The present study indicates that actively immunized persons continue to have measurable levels of serum tetanus antitoxin for up to 11 years and retain, during this period, the ability to produce high levels of serum antitoxin rapidly, in response to a booster injection of toxoid.

In civilian practice, therefore, it is recommended that a stimulating dose of tetanus toxoid alone be administered, when indicated, for the prophylaxis of tetanus in injured individuals who are known to have received previous active tetanus immunization. Efforts should be made to increase the number of the population enjoying basic immunity to tetanus.

The suggestion is made that the local health departments establish a permanent immunization roster.

—*Samuel Kahn, M.D.*

ANESTHESIA

Anesthesia in the Poor Risk Patient. C. S. Stone, Jr. and Daniel C. Moore. *Surg. Clin. N. America*, 1954, 34: 1249.

The term "surgical risk" is generally understood to mean the over-all risk to the patient subjected to anesthesia and surgical procedure. The two main factors affecting the outcome of the anesthetic administration are the physical status of the patient, which, if grossly abnormal, classifies him as a "poor risk", and the competency of the anesthesia service.

The degree to which the abnormal physical condition of the patient has progressed and the degree to which it may be controlled establish the status of the patient at the time he undergoes anesthesia. The following conditions are noteworthy since they create a defect which leads to some degree of hypoxia: shock and hemorrhage, respiratory diseases, obesity, cardiovascular disturbances, and metabolic disorders, including acute infections.

The principles involved in the sound administration of an anesthetic are the same, irrespective of the patient's physical condition. Blood loss results in hemoglobic hypoxia, circulatory failure in stagnant hypoxia, decreased respiratory exchange in tidal hypoxia, decreased oxygen in the air in atmospheric hypoxia, reduction of functioning alveoli in alveolar hypoxia, failure of utilization of oxygen by the body cells in histotoxic hypoxia, and increased oxygen demand by the body cells, from metabolic conditions, in demand hypoxia. Since the poor risk patient has one or more of these conditions, the prime object of the anesthetist is the correction of oxygen want and the prevention of more hypoxia or carbon dioxide accumulation. While doing this, a proper plane of anesthesia must be maintained, using the proper anesthesia technique indicated in each case.

The risk from the anesthesia per se depends upon the preoperative anesthetic management, the skill of the anesthetist, the availability of equipment, the choice of anesthesia and the manner of its administration, and the postoperative anesthetic management.

The goals of the preoperative management are to have the patient arrive in the operating room with an empty stomach, to have a clear airway, and to have a patient with a feeling of well being and with fear of the anesthesia allayed.

The person administering the anesthetic should be allowed to give the anesthetic which he feels can be administered most safely and effectively in each case.

Skillful management of the anesthetic period is most important. It includes: judgment of the adequacy of the premedication, starting of the intravenous fluids, maintaining an adequate airway, checking the blood pressure, pulse, and respirations, administering the correct fluids, maintaining safe surgical relaxation and insensibility to pain, and the use of a minimal dose of anesthetic to obtain optimal results.

Postoperative visits by the anesthetist should be a regular routine. He should co-operate with the surgeon in the prevention and treatment of complications following the anesthesia and the surgery, i.e., hypoxia, lung complications, spinal headaches, and cerebral edema following cardiac arrest.

The prevention of oxygen want is the keystone of success in the patient of poor physical status.

—*Samuel Kahn, M.D.*

Hypotensive Spinal Anesthesia; Respiratory, Metabolic, Hepatic, Renal, and Cerebral Effects. Nicholas M. Greene, John P. Bunker, Walter S. Kerr, John M. von Felsinger, and Others. *Ann. Surg.*, 1954, 140: 641.

Since the reintroduction of "hypotensive spinal anaesthesia," high spinal anaesthesia with resultant vasodilatation, hypotension, and ischemic operating conditions, relatively few objective studies of the possible undesirable effects of such techniques have been reported. Studies were carried out by the authors on patients in whom hypotension was induced by total subarachnoid sympathetic block. This technique was used in 140 cases, 67 of which served as material for this study. Its use was restricted to cases in which it was believed the bleeding would otherwise endanger the life of the patient or the success of the operation.

The data obtained in this series emphasize that the hypotension induced by blood loss, by extracellular fluid loss, by trauma, and by myocardial failure is a very different physiological entity, in so far as the inadequacy of the peripheral circulation and tissue oxygenation is concerned, from the hypotension arising in total sympathetic block. In the latter, the patient is not in shock, and chemical analysis of his blood shows no evidence of a failing circulation or anaerobic cellular metabolism.

Following hypotensive spinal anesthesia there was no significant disturbance of pulmonary ventilation, blood concentrations of cellular metabolites, or acid-base balance. The postoperative disturbance in liver function following this technique was no greater than that following similar operations with conventional techniques. Prolonged depression of renal function was observed in one case.

The demonstration of mental impairment in 5 out of 24 cases is alarming, but preliminary control studies suggest that this may be related to the magnitude of the over-all surgical experience rather than to hypotension itself.

The authors believe that it still remains to be seen how much the hypotensive techniques add to the success of the surgical performance, and how much they decrease the margin of safety. Until such information is available they urge that these techniques be used with caution. —*Ely Elliott Lazarus, M.D.*

Artificial Hypothermia; Definition; Results in Clinical Experiments and Clinical Use (Ueber die kuenstliche Unterkuehlung; Definition, tierexperimentelle Ergebnisse, klinische Andwendungsmoeglichkeiten). ANDRÉ JUVENELLE and WALTER SCHIESSLE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 279: 756.

HYPOTHERMIA is present in natural hibernation. The body temperature drops down to the external temperature, the metabolism and function of all of the organs are markedly decreased, the respiration and heart never stop. If the "Kern temperature" (internal temperature of the body) goes down, for instance, under 3 to 5 degrees C. the animal will awaken until the temperature has risen again. In artificial pharmocodynamic hibernation the vegetative and central nervous system are depressed. At the beginning of hypothermia without, or with very superficial, anesthesia there is an increase in the metabolism and in the heart action and also maximal excitation of the centers in the medulla. After exhaustion the Kern temperature will soon drop and death will occur at about 20 degrees C. If deep anesthesia is used in hypothermia the reflexes of the vegetative system will be depressed. A decrease in the metabolism is present. To prevent anoxia, artificial respiration with oxygen is necessary. If the Kern temperature drops to between 10 and 20 degrees C. death will occur. There is no danger above 20 degrees C. as was shown in animals.

Experimental status of deep artificial hypothermia in animals. A marked decrease of oxygen reabsorption was found. If the rectal temperature drops to 30 degrees C. the decrease is 50 per cent. At 20 degrees C., 10 per cent of the normal oxygen will be used. Damage through hypoxia was found in the heart muscle and in the nervous sytstem. This occurred usually in very deep hypothermia studies or in the warming-up phase.

Studies on the dog heart isolated according to Starling show that the temperature has to be very low to cause decrease of the heart frequency. In order to test the capabilities of tissue to resist ischemia, the aorta was clamped below the subclavian artery. Under normal temperature, damage occurs after 30 minutes. Under hypothermia (20 degrees C.) no damage was found after 2 hours and 15 minutes. On the other hand, interruption of the coronary arteries and brain circulation cannot be tolerated. Death in hypothermia was usually due to heart fibrillation. By using an artificial heart-lung apparatus and electric shock death could be prevented. Studies of the heart in short and long term hypothermia were made.

Clinical use of artificial deep hypothermia in human beings. Deep hypothermia was used in 20 patients for heart, lung, or esophageal surgery. Their ages ranged from 6 weeks to 60 years. Some of the patients were in very poor condition so that the usual anesthesia could not be used. Four deaths occurred in the warming-up period and 2 patients died on the operating table. During hypothermia the skin of the patient looks pale. The systolic pressure is between 50 and 70 mm. of mercury. The pulse rate is reduced. Spontaneous breathing is present if no curare is used. Under the present circumstances the Kern temperature should not go below 21 degrees C. Further investigations are necessary before using hypothermia in human surgery.

—*Frank R. Lichtenheld, M.D.*

Role of Antihistaminic Drugs in Regional and Spinal Analgesia. C. R. STEPHEN, W. K. NOWILL, H. HALL, R. MARTIN, and G. MARGOLIS. *Anesthesiology*, 1954, 15: 601.

EXPERIMENTAL INVESTIGATION has shown that the antihistaminic drugs may block the transmission of impulses along nerves, and produce an end result similar to that of procaine.

The authors, in an attempt to determine to what extent antihistaminic drugs approached the ideal attributes of a local anesthetic drug, performed regional and subarachnoid injections in rabbits and in human patients.

The methods of investigation in rabbits are discussed at length. The experiments revealed that the tested antihistaminic drugs were effective in producing regional and spinal analgesia in rabbits, but that their injurious effect on tissue in therapeutic concentrations makes them undesirable analgesic agents in man.

Clinical investigations demonstrated that at least one of the drugs used produced intradermal anesthesia, regional nerve analgesia, and subarachnoid analgesia, but probably not as safely nor as efficiently as with time-tested local anesthetics. Intradermal wheals with 4 per cent concentrations produced irritative reactions and necrosis of the area injected, but not when procaine was used. Thus the therapeutic-toxicity ratio, at least for dermal tissues, is less for the antihistamine than for procaine. Over 50 per cent of patients who were subjected to spinal anesthesia showed abnormal findings in the cerebrospinal fluid. Probably, also, the systemic toxicity of triphenamine is contrary to the "ideal" local anesthetic drug.

—*Robert Paradny, M.D.*

SURGICAL INSTRUMENTS AND APPARATUS

The Surgical Correction of Chronic Lymphedema of the Legs. THOMAS GIBSON and J. SCOTT TOUGH. *Brit. J. Plast. Surg.*, 1954, 7: 195.

TWENTY CASES of lymphedema of the legs, and the methods of surgical correction are discussed in this most interesting paper. The duration of the condition varied from 2 to 26 years.

The authors state that the edema is entirely confined between the skin and deep fascia of the leg and its persistence leads to a gradual overgrowth of fibrous tissue in this subcutaneous compartment. This fibrosis can be demonstrated at operation as being most marked just superficial to the deep fascia, which itself may be greatly thickened. In the established cases it is this fibrous replacement which prevents a return to normal with rest and elevation, and dooms to failure operations designed to "drain" the limb. In these, surgical correction is necessary. Although a late stage of the disease is described, in which fibrous replacement is complete and a nonpitting edema results, all of the patients have shown some pitting on pressure while ambulant. After some days of rest and elevation of the limb, however, when the excess fluid had been absorbed, the residual swelling was nonpitting.

The authors have used various methods, including a modification of Homan's technique, to correct the condition. At present they have evolved a one-stage technique in which the operating time is under 2 hours, the blood loss is minimal, and postoperative shock has not occurred. Good teamwork is necessary, and two surgeons work together with one or two assistants.

Bone traction is first applied to the calcaneus of the affected leg by means of an ice-tong caliper. A rope is attached which passes over a pulley in the theater roof and the leg is raised to a vertical position. The end of the operating table is then dropped so that the other leg hangs downward from the knee. A pneumatic tourniquet is placed around the upper thigh as described in the article and the pressure is maintained at 200 mm. Hg. A posterior incision is made down to the fascia over the gastrocnemius muscle and the dissection proceeds forwards, one surgeon on each side. The deep fascia is retained unless a previous Kondoleon operation has been performed or the fascia has been greatly thickened. In dissecting deep to the deep fascia care must be taken not to stray along the intermuscular septa or to open the tendon compartments on the front of the ankle.

Another surgeon prepares the skin graft from the excised mass. This is first cut into three labelled strips, each of which is flattened out on a board by judicious packing with cotton wool. A few longitudinal incisions through the edematous subcutaneous tissue correct any tendency to curl. The graft is removed from the surface with the Humby knife. The graft is cut at just less than full skin thickness, and provided that sufficient care has been taken to obtain a flat surface all the skin may be removed with ease, apart from some very slight loss at the end of each strip.

The authors believe that the one-stage operative technique has proved not only a much simpler and less formidable procedure, but that it gives a much better cosmetic and functional result than the methods previously used. The decision as to what degree of lymphedema justifies operation must still be an individual one. The rate of progression of the lesion must be taken into account. This varies considerably, and when the leg is steadily increasing in size, operation is best carried out as early as possible.

The authors add a significant afterthought: "It is hoped that eventually a fuller understanding of the etiology of lymphedema will render obsolete operations of this kind." —*Frank W. Pirruccello, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

The Relationship Between the Third Ventricle and the Basilar Artery. T. GREITZ and S. LÖFSTEDT. *Acta radiol.*, Stockh., 1954, 42: 85.

IN ORDER to understand the relationship between the third ventricle and the basilar artery, a review of the anatomy of the third ventricle is necessary. The floor of the third ventricle consists of the chiasma, the tuber cinereum with the infundibulum, the corpora mammillaria, substantia perforata posterior, and the peduncles. The substantia perforata posterior also forms the roof of the cisterna interpeduncularis. The basilar artery is located within the cisterna interpeduncularis and bifurcates into the posterior cerebral arteries within it.

The authors studied the relationship between the basilar artery and the third ventricle by means of encephalography and vertebral angiography. It is repeatedly stressed that proper visualization of the floor of the third ventricle can only be obtained in encephalography when the neck and head are extended and the x-ray beam is directed in a horizontal plane. The floor of the third ventricle when thus viewed in adults forms a convex curve upwards to the aqueduct. The recessus opticus and infundibula vary normally in size, shape, and position with respect to the base of the skull. The basilar artery, in fifty vertebral angiograms, was found to lie in the superior and posterior quadrant of a circle of a 20 mm. radius whose center was at the dorsum sellae. When combined studies, encephalography and angiography, were performed the basilar artery was found to be in a rather constant relationship to the floor of the third ventricle. The space between the basilar artery and the third ventricle varied only from 0 to 6 mm. This was a constant finding even with changes in size and shape of the ventricle.

In 5 cases in which both encephalography and vertebral angiography were carried out a deformity of the floor of the third ventricle was found. This deformity was seen at the bifurcation of the basilar artery and in these 5 cases an elongated and diffusely dilated basilar artery was shown.

All of these patients were 50 to 60 years of age and had evidence of arteriosclerosis and marked hypertension.

Pathologic studies indicated a disturbance of the elastic tissue of the arteries rather than in the muscle layers. The condition is referred to as ectasia of the arteries.

The defect produced in such cases of basilar artery impression on the third ventricle must be differentiated from craniopharyngiomas, and tumors in the hypothalamus and pons. In cases of craniopharyngiomas the rostral portion of the third ventricle with its recesses is always deformed. Tumors of the pons and hypothalamus, or tumors which protrude from the membranes in or around the basilar cisterns compress or fill up these cisterns which, in basilar artery impressions, are generally larger than usual.

—John J. Gaughan, M.D.

The Sternocostal Enterocele; a Contribution to Nomenclature, Frequency, and Roentgenologic Findings (Die sternokostale Enterocele; ein Beitrag zur Nomenklatur, Haefigkeit, und dem Roentgenologischen Erscheinungsbild). H. POPPE. *Fortsch. Roentgenstrahl.*, 1954, 80: 723.

AN INSTANCE OF HERNIA of Morgagni is reported. This anomaly was uncovered as a chance finding on the occasion of a serial roentgenologic examination of the patient. This was then only a diagnostic suspicion for which the patient was referred to the surgical service. Here the roentgenologic examinations were repeated; at the first attempts, even with effervescing powder, the hernial contents were not visualized, or perhaps it would be more precise to say that the findings could not be definitely interpreted. Only with a repetition of the technique were the unequivocal signs of the condition discovered.

The subsequent examinations demonstrated that a portion of the flexure region of the colon on the right side was in the hernial sac.

Despite the closest questioning of the woman patient, it was not possible to elicit the slightest evidence that the anomaly had ever caused any difficulty.

—John W. Brennan, M.D.

Ascariasis of the Biliary Tract; Roentgenologic Demonstration (Ascaridiosi delle vie biliari; dimostrazione radiologica per via reflua). S. GASPARINI and C. MENEGHINI. *Radiol. med.*, Milano, 1954, 40: 890.

THE AUTHORS report the case of a patient upon whom an upper gastrointestinal barium examination revealed reflux of barium into the biliary tree with outlining of a defect in the common bile duct consistent with the shape of Ascaris lumbricoides. Because the patient had proved ascariasis, and also had associated bouts of cholangitis with jaundice, it was concluded that there was an ascaris worm in the common bile duct. This was the first case reported in which a roentgenologic diagnosis was made.

—Alexander J. Conte, M.D.

Delayed Excretion in Urography and Its Significance. HANS IDBOHRN. *Acta radiol.*, Stockh., 1954, 42: 1.

RENAL FUNCTION is difficult to judge by the appearance of the kidney in delayed or absent excretion of contrast medium. It is not possible to date the onset of the obstruction. In acute urinary stasis, the commencement of the obstruction may be assessed, although the onset is often insidious. Another difficulty is that the obstruction is frequently only partial. Obstruction by a stone in the ureter may be intermittent, and complete obstruction may become partial if the stone is lodged in a bulge of the ureter or if a groove forms in the stone and thereby permits the passage of urine. Renal stasis is often associated with infection. It has been shown, in hydronephrosis, that the presence of infection favors the destruction of the parenchyma and inhibits regeneration. Different anatomic changes are capable of producing essentially the same

roentgenographic appearance. Excretion may be decreased or absent despite a healthy parenchyma. A fall of blood pressure below 70 mm.Hg. causes excretion to cease. In some cases, good excretion of the contrast medium is observed despite a poor renal parenchyma; in other cases of parenchymal destruction there may be impaired excretion of the contrast medium.

The author presents 4 cases, to demonstrate the difficulty of judging renal function by urographic appearance of the kidney. He suggests the use of renal angiography as a method of judging renal function.

—*Frank L. Hussey, M.D.*

Roentgen Examination of the Head of the Femur in Children and Adolescents; a Standardized Technique Suitable also for Determination of the Collum-, Anteversion-, and Epiphyseal Angles; a Study of Slipped Epiphysis and Coxa Plana. LARS BILLING. *Acta radiol.*, Stockh., 1954, supp. 110.

PROJECTION of a long bone on a roentgenogram without shortening can be accomplished only if the beam direction is perpendicular to the axis of the bone. Examination of the femur is complicated by the fact that the upper end of the femur presents three different axes: (1) the diaphyseal axis; (2) the collum axis; and (3) the epiphyseal axis, ie., a line perpendicular to the epiphyseal cartilage plane. Usually, when the femur is placed so that the diaphyseal and collum axes lie in the horizontal plane the epiphyseal axis will also lie horizontally, with the epiphyseal cartilage plane standing vertically. Thus, an anteroposterior film taken with a vertical beam is usually satisfactory for all three axes.

In the lateral view, three different projections are necessary in order that the beam direction may be at right angles to the part under consideration.

In children and adolescents in whom measurements, particularly of the angles, are required to observe or follow pathologic changes in the region of the epiphysis, it is essential that films be taken in a projection which will be reproducible and a projection which provides beam direction at right angles to the part being examined. For this purpose, in the frontal projection, it is recommended that the film be taken with the femur internally rotated to 20 degrees. One film is taken in the lateral view with the femur elevated 25 degrees and externally rotated by placing the lower leg, flexed 90 degrees horizontally, on a box. On this latter film the angle between the collum and the diaphyseal axis is measured, and the angle between the axis of the lower leg and the vertical line is also measured. These angle values are compared with normal values and if they fall within an acceptable range, the lateral and anteroposterior views taken will be acceptable for the judgment of any pathologic changes. An additional standard lateral view is taken with the femur elevated 25 degrees; the lower leg, which is flexed 90 degrees, slopes about 25 degrees against the horizontal plane so that the foot lies lower than the knee. This view is intended mainly for pathologic cases.

If the angles deviate considerably from the standard values, the views are less suitable, but on the basis of the angles determined suitable alterations in positioning and projection can be made to permit more accurate projections to be taken. Detailed formulas for such projections are described.

Displacement of the slipped epiphysis occurs mainly straight posteriorly. On a frontal view which is not correctly positioned an apparent displacement medially can be pointed out. The posterior displacement is measured, in the lateral view, as the distance between the edge of the epiphysis and the point of the collum where this edge normally should lie. In slipped epiphysis there is, as a rule, a bilateral abnormality present with a pathologically small epiphyseal angle. A roentgen technique especially intended for nailing of the slipped epiphysis in situ is reported.

The three standard projections, an anteroposterior projection and two lateral projections, are often suitable for diagnosis of a coxa plana. On views unsuitable for diagnosis, where the epiphyseal cartilage plane has not been at all vertical, there is risk that the initial stage will be overlooked. The value of obtaining repeated projections which are exactly alike is stressed. If measurements of the height and breadth of the epiphyses are to be done on the roentgenogram the projection which is to be used should be exactly defined, as these measurements are dependent on the projection.

—*Lois Cowan Collins, M.D.*

Vascular Occlusions in the Light of the Carotid and the Vertebral Angiogram (Gefaessverschluesse im Carotis- und Vertebralisangiogramm). K. DECKER and E. HOLZER. *Fortsch. Roentgenstrahl.*, 1954, 80: 565.

NINETY-SEVEN PATIENTS, in whom the roentgen findings suggested the presence of vascular occlusion, form the material for this article. This material was observed in the period between August 1, 1948 and August 1, 1951 at the neurologic clinic of the University of Muenchen, in Germany. The vascular occlusions were located in the cervical portion of the internal carotid artery in 35 instances and in the intracranial course of this vessel in 7. There were 42 instances of occlusion of the middle cerebral artery and/or its branches (these occlusions were mostly on an embolic basis), 2 occlusions of the anterior and 1 of the posterior cerebral arteries. There was occlusion of the vertebral artery in 3 instances and of the ophthalmic artery in 1 instance; in 6 instances there were multiple occlusions. Eleven angiographic reproductions accompany the text; however, no case histories are given.

Of the numerous statements, suggestions, and conjectures contained in this article only a few salient points can be mentioned with the hope of setting forth the authors' views with reference to the possibilities and the shortcomings of vertebral angiography. First in importance to be considered is, perhaps, the fact that angiography (arteriography) provides a purely morphologic picture of the pathologic processes involved. No reference is made to function. In this sense the method would seem not to furnish any more information than autopsy, in fact, not as much since it cannot clearly distinguish changes in the smaller branches of the vascular system, notably in the region of the so vital distribution of the vascular branches of the arteria cerebri media.

Nevertheless, the method shows some things that the anatomical dissection does not. Its efficacy in de-

lineating the moduses of the collateral circulation in these vascular occlusions has rendered necessary a revision of the one time conception of the anatomists that the small branches of the cerebral arteries are terminal vessels.

A justified objection to the method of angiography is that it does not disclose any arterial changes in the vast number of central nervous system lesions in which, anatomically also, no cause is found for the episode; if these lesions are the result of vascular spasm (a cerebral form of Buerger's disease) it is true that angiography does not show their inciting cause.

However, with proper and careful technique the stoppage of the circulation in the arterial system can be identified. The proximal limit of the occlusion, that is, the end toward the heart, is usually identifiable immediately; the distal termination may also be identified but the exposure must be made immediately after the injection in the large vessels, as the contrast material in the distal blood column is not very intense and rapidly fades out. In this connection the authors warn against making a diagnosis of obstruction simply on the evidence of the absence of contrast material in the peripheral blood, that is, in the portion of the blood column which is peripheral, or distal, to the blood which has just been injected with the contrast substance. In fact, an injection into the vessel wall, for instance into the wall of the lower or proximal portion of the internal carotid, may so interfere with the normal flow of blood distal to this point as to produce a relative "still stand" of the blood current more distally located. This relative "still stand" may thus prevent the immediate diffusion of the contrast medium upward toward the intracranial portion of this vessel and thus cause an erroneous diagnosis of occlusion.

In the smaller vessels this immediate diffusion of the opaque substance into the blood distal to the occlusion—perhaps by way of the collateral circulation—is not sufficient to help visualization of the blood column distal to the stoppage during the immediate, or arterial phase. There is, however, a later phase (venous), 1 or 2 minutes after the arterial, in which a "flow-back" of the shadow-casting blood seems to occur from the veins into the smaller arteries, permitting their visualization along with, frequently within, the shadows of the veins themselves. Such a phenomenon has been observed in approximately half of the authors' material.

With reference to the ultimate fate of the vascular occlusion as observed on the angiogram, but little can be said. It would seem that the only reported instance in which the process was followed for a considerable period of time was that of Gurdijan and Webster (*J. Am. M. Ass.*, 1953, 151: 541); in this instance the original intracranial carotid occlusion was found to progress downward toward the heart. In contrast to this finding the authors cite one of their patients in whom hemiplegia on the right side and total aphasia developed following excessive use of alcohol. The angiogram, taken 6 hours after the onset of symptoms, disclosed occlusion of the middle cerebral artery, accompanied by some uncertain changes in the cervical portion of the internal carotid artery. Amelioration of the symptoms under conservative treatment with heparin was poor and slow. Four weeks later, however, the middle cerebral artery was again patent and the angiographic findings were now entirely normal, but the paralysis and the aphasia persisted.

—*John W. Brennan, M.D.*

Angiographically Diagnosed Glomus Tumor of the Thigh. KARL-ERIC BORGSTRÖM. *Acta radiol.*, Stockh., 1954, 42: 33.

MOST GLOMERA are situated beneath the subpapillary vessels between the skin and the subcutaneous tissue. They are most common in the peripheral parts of the limbs. The function of these organs is to control the circulation and thereby the local peripheral temperature. Functionally, a glomus may be regarded as an arteriovenous shunt. It is built up of three parts: an arteriole, a shunt, and draining veins. The anastomosis consists of a number of endothelial-lined channels wrapped in a mantle of large epithelioid cells, so-called glomus cells. This mantle is in turn surrounded by smooth muscle tissue and a rich network of nonmedullated nerve fibers.

The author describes a glomus tumor of the deeper tissues of the thigh diagnosed by angiography in a man aged 42 years. The man had paroxysms of pain in the inner part of the left thigh for 5 years. He had been examined in various hospitals and in 1950 had surgery without detection of a tumor. In 1953 contrast medium was injected into the left femoral artery with demonstration of the glomus tumor adjacent to the femoral artery. The tumor was extirpated without difficulty. It was encapsulated and measured 12 mm. by 12 mm. It was built up of vascular tissues. The cells lining the vascular spaces were relatively large with medium-sized, rounded nuclei and relatively scanty cytoplasm. The pathological diagnosis was glomus tumor.

—*Frank L. Hussey, M.D.*

Cancer of the Thyroid and Radiotherapy: Mackenzie Davidson Memorial Lecture. B. W. WINDEYER. *Brit. J. Radiol.*, 1954, 27: 537.

THE VALUE of radiotherapy for cancer of the thyroid is reviewed in 157 patients referred for irradiation between 1940 and 1953. The ratio of women to men was 2.5 to 1, and the age range was 16 to 88. Among 118 patients whose histology could be checked, papillary adenocarcinomas were diagnosed in 29 per cent, alveolar lesions in 22 per cent, and undifferentiated lesions in 49 per cent. Younger patients tended to have papillary lesions, older ones had alveolar lesions, and elderly patients had undifferentiated lesions. Individual cases are cited to illustrate the tumor types and diagnostic problems.

Therapeutically, the classifications were as follows: (1) postoperative previously unsuspected cancer; (2) postoperative apparent complete removal of previously diagnosed malignancy; (3) incomplete or partial removal of locally inoperable lesions; (4) biopsy only; (5) far advanced cases and cases in which the patient lived less than one month after institution of therapy.

Treatment consisted of the application of roentgen rays with a half value layer of 2 mm. to 3–5 mm. of copper. In a few cases radium collar, teleradium, or radioactive iodine was employed. In therapeutic

groups 1 and 2, and in apparently localized lesions of the third and fourth groups, small x-ray fields were used to deliver 4,500 to 5,000 volts in 5 weeks. In other cases larger portals were used to deliver 3,000 to 3,500 volts in 5 weeks.

Five-year results with a survival rate of 37 per cent are reported for 92 of the patients. Patients with undifferentiated tumors had a 28.5 per cent 5-year survival rate. This was believed to be representative in contrast to the more differentiated lesions which seemed frequently to recur after 5 years.

In groups 1 and 2, x-ray therapy only was used for the undifferentiated cancer. In the other groups, the papillary adenocarcinomas required high dosage levels before any survivals were obtained. Little more than palliation was obtained in patients with alveolar carcinoma. Only 27 per cent of the patients with undifferentiated carcinomas survived 5 years. Fifty per cent of the less differentiated tumors showed clinical response to radiation.

The author describes the use of radioactive iodine in 4 cases of alveolar carcinoma.

—*George C. Lewis, Jr., M.D.*

The Tumor Problem, with Particular Reference to Treatment of Malignant Tumors with Roentgen Irradiation of the Diencephalon (Il problema dei tumori: per una terapia dei tumori maligni con la roentgen-irradiazione del diencefalo). G. DE GAETANI. *Rass. internaz. clin. ter.*, 1954, 34: 271.

MORE THAN 20 CASES of malignant tumor (carcinomas and sarcomas) have now been treated with roentgen irradiation of the diencephalon on the author's service at the Pathological Institute of the University of Modena, in Italy. The total dosages applied varied between 1,000 and 2,500 roentgens.

Among the results so far noted there has been an almost constant reduction in the size of the neoplastic mass and the mass of metastases. This reduction has been preceded by a transient increase in the size of the masses and a suggestion of colliquation. In some instances on the author's service it has been possible to obtain complete disappearance of the masses with evidence of sclerosis.

There has been noted a constant improvement in the general condition of the patients with reduction or complete loss of the pains, and recovery in physical strength, appetite, and body weight. In some of these instances, during the period of treatment, a complete suspension of the administration of analgesics and hypnotics has been possible.

There has been visible improvement on laboratory and functional examinations of the blood picture and of the functional indices of the various organs and physical moduses.

In some instances the possibility of surgery has developed, a step which has previously been considered inadvisable; and with operation it has been possible with biopsies to determine the presence of extensive phenomena of necrosis and of colliquation in the midst of the excised neoplastic mass.

Thus, the author considers that the beneficial effects must lead one to postulate that a particular anatomofunctional disease exists in the diencephalon of the cancerous individual which is benefited by the method here described in that the diencephalon is stimulated by the roentgen dosages administered to take up its functional duties again. Of course, it is not intended to imply that this method of therapy should replace surgery and physical forms of therapy, but it appears to constitute an adjuvant method in the general treatment of malignant tumor in the human being. Certainly the author has not encountered any practical contraindications to its application and he has not observed any secondary deleterious effects.

—*John W. Brennan, M.D.*

Some Radiosensitive Tumors. RALSTON PATERSON. *Edinburgh M. J.*, 1954, 61: 321.

A LIMITED GROUP of truly radiosensitive tumors offers the therapist an opportunity to gain satisfactory results with lesions often classed as highly malignant. These cancers are easy to destroy when their volume is small as they are so sensitive that low dosages are effective even when applied to large volumes of normal tissues. Only the sensitive lesions of unifocal origin can be treated with hope of cure. Typical examples of these are the nasopharyngeal radiosensitive tumors, the seminomas of the testes, and the medulloblastomas of the cerebellum.

The nasopharyngeal cancers include all but the differentiated squamous celled epithelioma. Radiation therapy must extend in continuity from the cervical nodes to and including the base of the brain. It should be carried to maximum tolerance of the pharyngeal and laryngeal mucosa. The results of such treatment for 76 patients is shown in the original article.

The extreme radiosensitivity and early abdominal metastases of the seminoma make it essential to irradiate the periaortic, iliac, and inguinal regions. Care must be taken to protect at least a segment of the kidneys. Therapy should extend over 5 to 6 weeks. The results of such a technique are shown in the original article.

A minimum of surgery, i.e., decompression and biopsy, precede the irradiation of medulloblastomas. Since a common characteristic of this tumor is widespread subarachnoid extension, the treatment should include the entire central nervous system from the calvarium to the sacrum. A special single posterior field including the brain and spinal cord has been utilized. To this have been added additional anterior brain fields. Shielding protects the body when posterior treatment is applied. The results of this treatment program are given in the original article.

—*George C. Lewis, Jr., M.D.*

MISCELLANEOUS

The Gamma-Ray Dose in Carcinoma of the Thyroid Treated by Radioiodine. A. F. PHILLIPS. *Acta radiol.*, Stockh., 1954, 41: 533.

THE DISTRIBUTION of radioiodine both in a normal thyroid gland and in a carcinoma of the thyroid capable of concentrating iodine has been reported by a number of authors. Autoradiographic studies often show very intense foci of activity, separated by large areas with little or no activity. In the case of the 8-day isotope I^{131}, by far the greater part of the ionization

within or close to the active region is due to the beta rays, and these have very small penetrating power. The gamma rays, on the other hand, cause relatively little ionization, and have greater penetrating power. Any point in a tumor receives an appreciable contribution of gamma radiation from all the radioactivity within some 30 cm. radius. Regions of low activity would be unimportant in practice if they consisted entirely of necrotic or nonmalignant tissue, but evidence will be presented that this is not always the case. In a spherical mass with uniform distribution of activity, the dose is maximum at the center, and falls off, according to a curve which depends upon the absorption coefficient, to approximately half this value at the periphery (Marinelli et al., 1948; Oddie, 1951). The gamma-ray dose, however, is far less affected by irregularities of distribution, and at regions of low activity which are surrounded by more active regions the reduction would be expected to be small, even though the gamma-ray dose might fall practically to zero.

The purpose of the experimental work reported here was to measure the actual gamma-ray dose at points in tumors containing I^{131}, and in particular the dose at regions of low activity. Autoradiographs were made from slices of tumors from 2 operative specimens made available by thyroidectomy on 2 individuals who had received large tracer doses of radioiodine 2 days previously, and in one of the cases of lymph node metastases. In the autoradiographs produced there was a variation in the uptake, depending on the type of tissue in the area.

In case 1, on the beta-ray autoradiographs of the embedded slices of the primary tumor there was a central region of very low or zero activity, surrounded by a shell of active tissue. The inactive region on the central slice measured 12 by 3 mm., and the thickness of it was too great to allow any effective beta radiation to reach its center. Histologic examination of the stained sections showed a broad correlation with the autoradiographic appearance, the central area being composed of fibrous tissue and the active rim of more or less differentiated carcinoma, with plentiful stroma. A few carcinoma cells were noted within the fibrotic core out of the effective range of beta rays. Gamma-ray autoradiographs were taken through a number of different absorbers from 2.4 mm. to 25 mm. in thickness. Gamma-ray doses were calculated for selected areas.

In case 2 the displaced surviving part of the thyroid was histologically normal, and gave a dense autoradiograph. The beta-ray autoradiographs were made of the primary tumor. There were regions of low uptake to 12 mm. in diameter. Gamma autoradiographs were taken as before, and two points were selected in regions of low activity for calculation of the gamma-ray dose. Histologic examination of small blocks later removed from these positions in the specimen showed mainly necrotic tissue in one, and in the other a densely cellular alveolar carcinoma with traces of colloid in places. There was a small uptake of I^{131} in the first region, sufficient to give a beta-ray dose of the same order of magnitude as the measured gamma-ray dose. In the second region there was no measurable uptake of I^{131}.

It is generally considered that radical radiotherapy requires a certain minimum dose of radiation to be delivered to every part of the tumor. In the cases investigated, even had very large amounts of I^{131} been employed, the dosage of beta rays would not have been adequate. Malignant cells were present in some regions of low activity. The gamma rays delivered a dose of radiation which, although in active regions much smaller than the gamma-ray dose, was relatively little affected by irregularities of distribution of the type found. This was the main form of radiation reaching those regions which did not themselves take up radioiodine. The gamma-ray doses measured in the lowest regions were not very different from those calculated for uniform distribution of radioactivity. In general, it may be impossible to give large enough gamma-ray doses by means of I^{131} to effect a cure. Other radioactive isotopes with iodine may prove more useful in the treatment of carcinoma of the thyroid. —*Frank L. Hussey, M.D.*

The Present Status of the Problem of Radiation Resistance (Der gegenwaertige Stand des biologischen Strahlenschutzproblems). H. LANGENDORFF. *Fortsch. Roentgenstrahl.*, 1954, 80: 581.

THE SHIELDING OF THE ORGANISM from rays is a problem of the physical sciences; the increase of the resistance of the organism, as well as the treatment of the irradiation damage once it has occurred, are problems of radiation biology. The first mentioned problem does not concern us here; in the other two fields of research encouraging progress is being made.

In the matter of raising the individual resistance toward the injurious dosages of irradiation, a number of substances, when administered before exposure to the rays, seem to tend—at least in animal experimentation—to confer a relative insensitivity toward all the irradiation moduses (roentgen rays, gamma rays of radium, and accelerated electron emissions). Perhaps the best among these substances is the cysteamins proposed by Bacq. The author has substantiated, by means of animal experiment, the efficacy of this substance and he therefore thinks that there is no objection to its being introduced into radiologic practice. Bacq considered that the protective effects of this substance were bound up with the amine radical, since cystinamin, the disulfid form of cysteamin, is just as effective; however, the author has shown that the cystinamin in the body is immediately changed into cysteamin. Therefore, Bacq's findings on cystinamin do not upset the postulation.

The protective effect is somehow connected with the SH-group in cysteamin. The author does not believe, however, that such effect is exclusively bound up with an SH-group in the protective substance used; his researches have led him to believe that numerous other chemical substances, e.g. nitrile, amins, and the lower alcohols, also exert this protective effect. All these substances are characterized by a relatively pronounced reduction effect. However, this statement is not meant to imply that the protective effect is in some way bound up with this reduction effect; this idea arose during the period when the only protective substances known were cystein and glutathion. Today it is understood that other so-called "redox-bodies,"

e.g. ascorbic acid, do not have any pronounced effect in this regard.

The author thinks that the protective effects reside in the chemical constitution of the protective substance rather than in its chemical potential (redox-potential) or behavor. The proof of this, the author thinks, resides in the fact that all the substances which have so far proved especially effective in the field of protection from irradiation effects have possessed a so-called "prosthetic group" which is characteristic of enzymes. In fact, the so-called "co-enzyme A" in the cysteamin preparation seems to be what is effective in cysteamin and certainly possesses a special significance in the matter of biologic irradiation effects.

The chief defect in all the protective substances so far studied has been that they remain in the body for only a few minutes, and would therefore have to be administered immediately preceding the exposure to the rays in order to procure maximum effects. It is therefore incumbent upon us to find some substance with these protective qualities which will remain in the body for a longer period. The studies of the author lead him to believe such substances are N-acetyl-cysteamin and thiourea. With the administration of these substances no diminution in the protective effects has been observed in the 2 hours following the administration, and in the instance of the N-acetyl-cysteamin the change in the chemical make-up rather heightens than lowers the protective qualities of this substance.

The possibility that irradiation-protection is bound up in some manner with the SH-group in the protecting substance would seem to be contradicted by thiourea which is not commonly thought of as possessing an SH-group. However, the author shows that such grouping is possible in this substance by the following chemical change:

$$S=C\begin{matrix}NH_2\\NH_2\end{matrix} \text{ and then: } SH-C\begin{matrix}NH\\NH_2\end{matrix}.$$

The great protective capacity of thiourea presents a new research problem; this much is clear, however; its irradiationprotective properties have nothing to do with its thyreostatic effects.

In the treatment of the irradiation effects once established, the most promising results so far achieved have been from the studies of Jacobson in screening the spleen from exposure to the raying of the experimental animal. In this work the author has achieved an appreciable result in keeping alive the experimental animals (rats) by the implantation in the irradiation-damaged animal of heteroplastic material in the form of the tissues of the suprarenal gland, the spleen, and the liver. His results in this regard may be consulted in the table appended to the original text. It seems to be demonstrated that the curative effects are bound up, in the splenic tissues, with the nuclear fraction and not with the mitochondria, microsomic component, or the soluble substances of the cell. Since pure nucleinic acid is totally ineffective in this regard, it would seem that the protective effects are concerned with the nucleoproteinic fraction.

From the small fraction of the reported work in the field, here expounded, it would seem that even if all the conclusions and hypotheses so far brought forward should prove to be more or less incorrect and subject to revision; nevertheless, the value of the knowledge acquired will remain a permanent gain for the field of radiobiology.

—*John W. Brennan, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Differences Between the Rate of Healing of Wounds Inflicted with Short Time Interval; Cutaneous Incisions. PH. SANDBLOM and A. MUREN. *Ann. Surg.*, 1954, 140: 449.

THE AUTHORS PRESENT a continuation study of a method of assessing wound healing by mensuration of tensile strength. Previously the authors had studied the effect of small technical errors, of asymmetric location of wounds, and the effect of a time interval between the infliction of the wounds.

In the most recent study, it was found that the difference in the rate of healing previously observed between wounds inflicted with a short time interval on rabbit's skin could be explained by the interval between depilation and the infliction of secondary wounds.

There is some evidence in support of the assumption that the delayed effect may be due to changes in cutaneous circulation in the recently shorn areas.

The investigation failed to produce any evidence of the release of a repair-promoting factor following trauma. —*W. Foster Montgomery, M.D.*

Ammonia Metabolism in Man. WILLIAM V. MCDERMOTT, JR., RAYMOND D. ADAMS, and ATHOL G. RIDDELL. *Ann. Surg.*, 1954, 140: 539.

STIMULATED by the production, in 1952, of a syndrome resembling hepatic coma produced by the feeding of nitrogenous substances to a series of patients with cirrhosis of the liver, the authors have revived the available information regarding normal ammonia metabolism in man. The syndrome of ammonia intoxication is defined, and a series of cases is presented in which gross disturbances in ammonia metabolism are associated with neurologic symptoms and reversible electroencephalographic changes.

It is suggested that either intrahepatic disease or portacaval shunt, spontaneously or surgically produced, or a combination of both, is the cause of the inability of the organism to rid itself of ammonia.

The biochemical effects of abnormal ammonia concentrations and a program of therapy are presented. —*W. Foster Montgomery, M.D.*

Exfoliative Cytology in the Diagnosis of Neoplasms (La citologia esfoliativa nella diagnosi delle neoplasie). EMANUELE ALATI. *Boll. oncol.*, Rome, 1954, 28: 93.

THE AUTHOR REVIEWS the European literature and evaluates the diagnostic criteria, the technique, and the methods and application of exfoliative cytology.

Among the diagnostic aids are the morphologic and histochemical criteria, and in the latter the different distribution of nucleic acids in the cells is stressed. The author reports favorably on the gelatin sponge biopsy method of Gladstone and on the Papanicolaou technique. The methods of Barigozzi and Dellepiane, Unna-Pappenheim, Feulgen, and others are reviewed.

The author believes that the gelatin sponge method is not generally used, that the Papanicolaou stain shows alterations in cytoplasm, but not in the nucleus, and that histochemical methods offer the best means of diagnosis. The method of Feulgen, in his hands, has given the best results.

Exfoliative cytology of the sputum proved positive in 52 per cent of 100 cases of operatively treated patients with lung cancer and in 66 per cent of 100 inoperable cases; the cytologic diagnosis was positive in 95 per cent of exudates caused by cancer. It is pointed out, however, that mass surveys are a very costly means of detecting cancer. —*Alexander J. Conte, M.D.*

Treatment of Juvenile Melanomas and Malignant Melanomas in Children. HENRY E. MCWHORTER, FREDERICK A. FIGI, and LEWIS B. WOOLNER. *J. Am. M. Ass.*, 1954, 156: 695.

THE JUVENILE MELANOMA is a newly identified lesion that appears to be benign and that can be differentiated histologically from malignant melanoma, with which it has been confused in the past. It comprises 6 to 8 per cent of all pigmented nevi surgically removed from children, and is rarely seen in adults.

The tumors are located most commonly on the head. They are relatively small, tend to be elevated, contain minimal pigmentation, and are not grossly hairy. Treatment consists of complete removal, which need not be radically extensive.

Malignant melanoma, while rare prepubertally, does occur in children and may spread metastatically and result in death. It is similar both histologically and clinically to the lesion seen in the adult, and treatment should be the same. As wide an excision of the primary lesion as practicable should be done, and the resulting defect closed with a skin graft. The patient should then be checked frequently for any evidence of lymph node involvement, and if this is found, regional dissection is indicated. The authors state that routine "prophylactic" dissection for nonpalpable nodes is not warranted on the basis of present evidence.

—*Ely Elliott Lazarus, M.D.*

Liposarcoma; a Study of 105 Cases. GEORGE T. PACK and JOHN C. PIERSON. *Surgery*, 1954, 36: 687.

THE PRESENT report deals with the largest group of liposarcomas studied thus far. Benign lipomas are more commonly situated in subcutaneous tissues, but the malignant variety seems to have a greater predilection for the deeper soft tissues. They may occur wherever fat is present. The lower extremity accounted for 62.7 per cent of the liposarcomas; only 24 per cent developed in the upper extremities.

The possibility of malignant lipogenic tumors developing in pre-existing benign lipomas is to be admitted, but the majority of liposarcomas undoubtedly occur *de novo*. The great frequency of lipomas and the rarity of liposarcomas would indicate that the percentage of lipomas undergoing malignant degeneration must be very low.

The authors wish to emphasize that in the surgical treatment of liposarcomas, it is wise to remove these tumors without ever seeing or encountering them. By this is meant that the investiture of the neoplasm by muscle, fat, and fascia remains intact and that the line of dissection is grossly well beyond the palpable limits of the tumor in all directions. Enucleation of the pseudoencapsulated mass leads to recurrence and the recurrent tumor is usually more cellular, more anaplastic, and infiltrative rather than expansile in growth. If the tumor lies above the fascia, the wide excision should include the fascia. In the compromise of selecting local removal over amputation for these malignant tumors, the surgeon should not relax his vigilance in accepting simple enucleation as an easy substitute for the always essential radical dissection. The entire group of muscles involved by, or encompassing, the intermuscular liposarcomas should be removed from their origins to their insertions. If the sarcoma is located in an extremity, the order of dissection is from above downward.

If preoperative irradiation is given, 5 or 6 weeks is permitted to elapse in order for maximal regression to occur and the radiation reaction to subside. Even when a previously palpable liposarcoma has regressed following x-ray therapy, so that it is no longer clinically apparent, a wide dissection should still be carried out. Residual liposarcoma may be found on microscopic study of the excised specimen. If amputation is decided upon, the upper level must be as high above the palpable limits of the tumor as is possible. The general rule of the amputation above the level of the origin of muscle groups involved by the sarcoma is a good principle to observe. Amputation may be necessary if there are multiple foci of liposarcoma in the extremity, if the tumor extends indeterminably high along the intermuscular and fascial planes, if it is immovably adherent or if it invades bone.

The embryonal myxoliposarcomas are known to be radiosensitive. In earlier years of this present experience, preoperative irradiation was routinely employed. Analysis of this group shows that in 60 per cent of patients a definite regression of the tumor had occurred, and in 15 per cent the liposarcomas underwent complete clinical disappearance. Microscopic foci of residual sarcoma, however, were found in the majority of surgical specimens subsequently removed. Preoperative radiation is never given to liposarcomas which overlie bone, nor for those which invade the bone. It is not infrequent that primarily inoperable liposarcomas have been made technically resectable by preliminary irradiation, especially in the case of bulky retroperitoneal tumors of this type. The authors believe that postoperative irradiation is indicated in every instance in which the resected tumor was a recurrent one. —*Orville F. Grimes, M.D.*

EXPERIMENTAL SURGERY

A Study of Liver Damage Following Induced Hypotension. WILLIAM G. ANLYAN, WILLIAM W. SHINGLETON, WALTER R. BENSON, C. RONALD STEPHEN, and Others. *Surgery*, 1954, 36: 375.

THE AUTHORS sought to evaluate the extent of liver damage following induced hypotension. Hypotension was created by biochemical means and by induced hemorrhage.

Prior to creation of hypotension, biochemical studies consisting of blood nonprotein nitrogen, serum chloride, sodium, potassium, carbon dioxide combining power, bromsulphalein retention, thymol turbidity and flocculation, and serum bilirubin determinations were made. After the period of controlled hypotension, the laboratory determinations were made twice weekly.

Hypotension was created by an intravenous drip of a ganglionic blocking agent (Arfonad-Hoffman LaRoche) to a dog anesthetized with pentobarbital. Levels of pressure at 30 ml. of mercury were maintained for a period of 30 minutes in 10 dogs and for 45 minutes in 11 dogs. At the end of the hypotensive period, the drug was discontinued and the pressure was observed to gradually rise to normal. In some instances, a vasopressor drug was used to aid in restoring the blood pressure to normal.

For comparative purposes, 20 dogs were made hypotensive by rapid bleeding until the blood pressure fell at 30 ml. Ten dogs were kept hypotensive for 30 minutes and another 10 dogs were kept hypotensive for 45 minutes. After the termination of the hypotensive period, the withdrawn blood was returned. All dogs received 10,000 units of aqueous penicillin and 300,000 units of procaine penicillin at the beginning of the hypotensive period. The procaine penicillin was continued each day for one week. The animals were sacrificed at 15 and 30 day periods following the hypotensive episodes.

RESULT OF BIOCHEMICAL STUDIES IN THE VARIOUS GROUPS

30-Minute group	*45-Minute group*
Chemical Hypotension	
Dog # 4 BSP retention 10% on 3rd day	Dog # 8 Died, "irreversible"
Dog # 5 Negative	Dog # 9 Died third day
Dog # 6 Negative	Dog #11 Died first day
Dog # 7 Negative	Dog #13 Negative
Dog #20 Negative	Dog #14 BSP retention 15% on third day
Dog #21 Negative	Dog #15 Negative
Dog #36 Negative	Dog #17 Negative
Dog #37 Negative	Dog #18 BSP retention 20% on fifteenth day
Dog #38 Died first day	Dog #19 Thymol flocculation 2 plus on fifteenth day
Dog #39 Negative	Dog #22 Died tenth day
	Dog #36 Negative
Hemorrhagic Hypotension	
Dog #82 BSP retention 25% on 8th day	Dog #27 Negative
Dog #85 Negative	Dog #28 Died third day
Dog # 1 Negative	Dog #29 Negative
Dog #23 Died first day	Dog #30 Died second day
Dog #24 Negative	Dog #31 Died, "irreversible"
Dog #25 Died, "irreversible"	Dog #32 Thymol turbidity 7.5 units on 21st day
Dog #35 Negative	Dog #33 Died first day
Dog #40 Died second day	Dog #43 Died first day
Dog #41 Died first day	Dog #44 Died second day
Dog #42 Negative	Dog #34 Negative

There was no appreciable change in the blood nonprotein nitrogen or serum electrolytes of any of the dogs.

Microscopic studies were carried out on all liver specimens and the only significant changes were noted to occur in animals dying within 2 days following the period of hypotension. These changes consisted of necrosis of the paracentral cells and dilatation of the paracentral sinuses in the first 24 hours. In the 24 to 48 hour period, necrosis of parenchymal cells became more obvious and more extensive.

In comparing the two series of animals in which the hypotension was induced by different means, the authors consider that two complete pictures were seen, since, in the chemically induced hypotension, the blood volume is not decreased and the drop in peripheral arteriolar resistance can be interpreted as producing better perfusion of tissues as opposed to the vasoconstriction in the hemorrhagic picture.

The authors concluded that in dogs surviving the hypotensive state, produced either by chemical blockade or hemorrhage, there was discernible liver damage which, on biochemical function tests and histopathologic studies, was minimal 15 to 30 days following the period of hypotension. On the other hand, in all dogs dying within 3 days following the period of hypotension there was marked evidence of liver damage. —*Yoshio Sako, M.D.*

The Renal Circulation in Experimental Hypertension; Angiographic and Morphologic Studies in the Rabbit. P. M. DANIEL, MARJORIE M. L. PRICHARD, and J. N. WARD-MCQUAID. *Brit. J. Surg.*, 1954, 42: 81.

THE OBJECT of this study was to investigate the renal circulation in experimental hypertension to determine, if possible, whether or not there was a reduction in cortical blood flow while the medullary circulation was increased or maintained. Rabbits were used as the experimental animals. An ear cuff method was used to record arterial blood pressures. Hypertension was produced by unilateral nephrectomy and a silver clip was applied to the remaining renal artery. Under ether anesthesia angiograms of the kidney were obtained with thermostat injection into the carotid artery or the abdominal aorta, and serial x-ray exposures were made.

The ear blood pressure cuff gave arterial pressure readings consistently 16 to 19 mm. Hg. below that of the carotid or aortic intra-arterial pressures. In some animals, blood pressure distal to the renal clip was measured by direct puncture and found to vary from 3 to 20 mm. Hg. below aortic pressure in 3. One hundred and twenty-four rabbits survived for more than 2 days after application of the clip; 55 animals appeared normal, but had a blood pressure elevation—classified as chronic benign hypertension; 34 animals died of hemorrhage, uremia, or arterial necrosis—designated as "malignant" hypertension; 35 animals died of miscellaneous causes. Renal angiograms showed a prolonged circulation time in all animals with elevations of the blood urea nitrogen.

In the first few days after "clipping" all angiograms showed a prolonged circulation time. Hypertensive animals with renal failure had markedly impaired renal circulation but it was impossible to determine whether the cortical circulation was reduced more than the medullary circulation. Angiograms of hypertensive animals without renal failure were within normal limits and a diversion of circulation into the medulla was not apparent. Examination of specimens was carried out by routine histology and no renal lesions were observed in any group. In the "malignant" hypertensive group fibrinoid necrosis of systemic arterioles was noted. Examination of the renal circulation by injection of neoprene and cast formation failed to show any alteration in cortical circulation without a concomitant and comparable change in the medullary circulation. It would thus appear that the theory propounded by Trueta in 1947, that in chronic hypertension there is a diversion of some of the blood flow from the cortex to the medulla, does not apply to the rabbit with long-standing clip hypertension.

—*C. Barber Mueller, M.D.*

Hemostatic Action of Thrombokinase; Experimental and Clinical Observations (Sull'azione emostatica della trombochinasi; ricerche sperimentali ed osservazioni cliniche). ARMANDO AGHINA. *Gior. ital. chir.*, 1954, 10: 609.

AFTER REVIEWING the literature on blood coagulation and hemostatic substances used in Europe, the authors report on the experimental and clinical use of a preparation of thrombokinase made from cerebral tissue of the ox (thrombokinasi 733) and known in Italy under the name of tachostyptol.

Studies in vitro with this material show that in large amounts it lengthens the clotting time, while in small amounts it shortens it. Intravenous injection of thrombokinase 733 in dogs shortens the coagulation time within 30 minutes, lowers the recalcification time of plasma, and has a variable effect on the prothrombin time.

Administration of this material intravenously was carried out in 9 patients who were operated on, 6 receiving it before surgery. The authors state that this material diminished bleeding at operation, prevented postoperative hemorrhages in prostatectomy and thyroidectomy, and was useful in controlling hemorrhage when it did occur. It is concluded that "thrombokinasi 733" can be depended on for good constant hemostatic action, and that its use is nontoxic and not lethal.

—*Alexander J. Conte, M.D.*

The Healing of the Disrupted and Resutured Wound. EDWIN D. SAVLOV, J. ENGLEBERT DUNPHY, and MARGUERITE A. ANDERSON. *Surgery*, 1954, 36: 362.

THE AUTHORS have subjected to a laboratory test the clinical observation that there is excellent healing of an abdominal wound following dehiscence and resuture. White male rats, weighing 180 to 220 gm., were used. The standard wound was a 4 cm. left rectus laparotomy incision. The wounds were closed with No. 32 stainless steel wire. The wound tensile strength was measured by recording the total weight of water and bag which was required to create dehiscence by traction of the weight on heavy silk sutures placed through the skin near the wound. Seven groups of abdominal wounds were studied by the above maneuver.

Group 1. A total of 50 abdominal wounds were tested on the third postoperative day. The tensile

strength varied from 0 to 253 gm. with a mean of 124 gm. This value served as a base line.

Group 2. The abdominal wounds of 17 rats from group 1 were resutured and tested 3 days later. The tensile strength ranged from 336 gm. to 830 gm., with a mean of 569 gm. All resutured wounds were at least three times as strong as the wound had been as a 3 day primary wound.

Group 3. Twenty rats were operated upon and the primary wound was permitted to heal for 6 days before testing. The tensile strength varied from 450 gm. to 1,150 gm. The mean was 816 gm. This group revealed that a 6 day primary wound was stronger than a wound which was disrupted at 3 days, resutured, and tested 3 days later (group 2).

Group 4. In order to assess possible systemic factors related to pituitary-adrenal stress, two groups of rats, 8 in each group, were given ACTH or cortisone in place of a primary wound. One group of rats were given 6 units of ACTH intramuscularly daily for 2 days, and the second group of rats received cortisone, 5 mgm. intramuscularly, for 3 days. Three days after the drug had been started, a standard wound was made in each group and 3 days later the wounds were tested. The results showed the mean tensile strength was 126 gm. in the cortisone group and 175 gm. in the ACTH group.

Group 5. To evaluate local factors, the wound margins were excised prior to resuture of the wounds following dehiscence of the primary wound on the third postoperative day. In 5 rats in which 2 ml. of wound edge was excised, the mean tensile strength after resuturing and testing on the third day was 405 gm. When 5 ml. of the wound edge was excised in 8 rats, the mean tensile strength of the third-day resutured wound was 235 gm.

Group 6. To assess the role of severe postoperative stress on wound healing, 11 rats were given 5 mgm. of cortisone daily for 2 days prior to the primary wounding, and the cortisone was continued for 6 days postoperatively. The mean tensile strength of the 3 day wound was 119 gm. Following resuture of the wounds, 5 rats died by the sixth day, and the mean tensile strength of the resutured wounds in the remaining animals was only 121 gm. Another group of 9 rats was treated with cortisone after the first tensile strength reading was obtained on the third postoperative day, and these animals showed that the primary wound averaged 136 gm., and the 3 day resutured wound after cortisone averaged 520 gm.

Group 7. To assess the role of age of primary wound and recovery after dehiscence, 77 rats were wounded and permitted to heal up to 40 days before disruption and resuture. The results showed the greatest rehealing effect was at its peak on the third day after resuture of the primary wound.

From the results obtained the authors concluded that the rapid assumption of strength by the resutured wound occurs because the process of cellular proliferation is interrupted only temporarily by the disruption of the wound, and the wound need not go through the latent period as in the primary wound. Since excision of the wound edges does not completely abolish this effect, the authors believe there are alterations in the local environment of the healing wound which accelerate healing. Cortisone in large doses started prior to wounding retards healing, but when cortisone is administered after the disruption of a primary wound, the resutured wound continues to show accelerated wound healing. Physical and chemical changes occurring in healing tissues require further investigation. —*Yoshio Sako, M.D.*